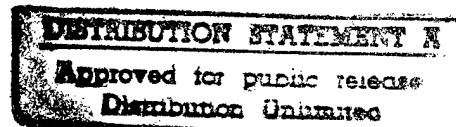


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RYABOV ON S&T PROGRESS, INTENSIFICATION OF PRODUCTION

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 10, Oct 82 pp 3-17

[Article by Ya. Ryabov, First Deputy Chairman, USSR Gosplan, under rubric "11th Five-Year Plan: Experience, Problems": "Administration of Scientific-Technical Progress and the Increase in the Effectiveness of Production"]

[Text] The Basic Directions for the Economic and Social Development of the USSR in 1981-1985 and for the Period Until 1990 state, "During the 11th Five-Year Plan the development of science and technology must be to an even greater degree subordinated to the resolution of the economic and social tasks of Soviet society, to the acceleration of the transition of our economy onto the path of intensive development, and to increasing the effectiveness of social production" (*Materialy XXVI s"yezda KPSS* [Materials of the 26th CPSU Congress], Moscow, Politizdat, 1981, p 143).

The steady development of science and technology, the intensification of scientific-technical potential, has been and continues to be the decisive factor in the growth of the economy. The introduction into practice of progressive and highly effective technical decisions is becoming not only a socioeconomic, but also a very important political task; its successful fulfillment makes it possible to win the victory in the competition between socialism and capitalism. ". . . The one who gets the upper hand," V. I. Lenin wrote, "is the one with the highest level of technology, organizational spirit, discipline, and the best machines. . ." (V. I. Lenin, *Poln. sobr. soch.* [Complete Collected Works], Vol 36, p 116).

With the acceleration of scientific-technical progress there is also an intensification of the importance of science, which penetrates to a greater and greater degree into the field of economics, and becomes an inseparable organizational-technical element in the production process, the basis of the increase of its effectiveness and labor productivity. The successful development of production is impossible without the active participation of scientists, designers, technologists, and other specialists. At the same time there has been a considerable increase in the role played by the working class, its level of proficiency, its general educational, technical, and cultural level. Therefore, at the present-day stage, under conditions of mature socialism, economic science, the planning agencies, and the ministries and departments are confronted by the task of studying the dialectics of the economic natural laws underlying scientific-technical progress and its influence upon all aspects of the life of Soviet society, and of applying the

most efficient forms of administering the development of science and technology and the introduction of scientific-technical achievements.

The economic importance of scientific-technical progress lies in the fact that that progress is the basis for the intensification of production and the increase of its effectiveness and volumes.

The creation and introduction into production of modern, more powerful, more productive systems of machinery and new technological processes contributed to the planned rise in the industrial level of the socialist economy. The following figures can serve as an example: whereas in 1940 the country's daily production was 133 million kilowatt-hours of electrical energy, 85,000 tons of coal, and 453,000 tons of coal, in 1980 the quantity of electrical energy produced increased by a factor of 27, coming to 3,528 million kilowatt-hours per day, and the production of petroleum with gas condensate and of coal increased respectively by a factor of 19 and 4.3, that is, to 1,648,000 tons and 1,961,000 tons per day.

The dynamic buildup of our country's economic potential is now based not only on an increase in the number of persons employed in the national economy, but to a greater and greater degree upon the acceleration of scientific-technical progress, and the taking of all steps to use the achievements of science and technology in the branches of the economy. At the present time three-fourths of the increase in the labor productivity is achieved as a result of the introduction of scientific-technical innovations.

The broad network of scientific institutions, scientific-production associations, experimental and test bases of the design and technological-planning institutes and KB [design bureaus] that employ more than 1.4 million scientific and 12 million engineer-technical workers, makes it possible to carry out research and development, to create progressive tools and objects of labor, technological processes, and control systems, and to introduce them into all areas of science and technology and branches of the national economy. All this makes it possible in a planned procedure to increase the use in the national economy of scientific-technical achievements and to resolve successfully such complicated problems as the application of fundamentally new sources of energy, the conquest of outer space, the development of biology, genetics, and organic synthesis, the expansion of our country's mineral and raw-materials base, etc. Research is being carried out broadly in the area of theoretical and applied mathematics, and the work of improving the physical, chemical, and mathematical foundations of electronic-computer technology.

There has been an increase in the rate of providing equipment to industry, agriculture, capital construction, and other branches of the economy. Many modern production entities have been created on the basis of scientific achievements. The link between science and production is becoming closer and closer, primarily as a result of the formation of production and scientific-production associations, the number of which in the country exceeds 4000. Thanks to fundamental research that was carried out during the past 15-20 years, fundamentally new technological processes and equipment have been created and introduced in most of the branches of production: automated coal-mining complexes and systems of machinery; units for the continuous pouring of steel, electroslag smelting and casting; equipment for

non-spindle spinning and non-shuttle weaving; machine tools for the electrophysical and electrochemical processing of metals and certain other structural materials; equipment for low-waste and no-waste technological processes of automatic welding of multitonnage parts and large-diameter pipes; etc.

The achievements of scientific-technical progress are actually tangible, but they do not yet always satisfy the requirements of modern production. At the same time the planning indicators for the introduction of new technology have been fulfilled by 85-90 percent for many years. A consequence of this is the partial shortage of the latest equipment for machine-building and machine-tool-building, and the chemical, food, textile, and other branches of industry. Domestic machine-building is taking practically its first steps along the path of providing modern technology to the sphere of services, retail trade, education, and public health. There has been a slow rate of assimilation of fundamental new systems of machinery that assures a sharp increase in labor productivity. Machine-builders are still producing a considerable amount of obsolete technology. The delay in removing it from production is a cause for a constant increase in the percentage of output that has been in production for more than 10 years. For example, its share in the overall production of finished articles for 11 machine-building ministries in 1981 was 30.6 percent, as compared with 26 percent in 1976, and 16.2 percent in 1967. During the past five years the share of this kind of output increase in Minenergomash by 12.9 percent; Minsel'khoz mash, by 13.1; Minstroydormash, by 8.5 percent. This results in the saturation of the national economy with obsolete, relatively ineffective technology.

At the present time one observes the disruption of the proportions of renewing the production assets, primarily in industry; the time period required for replacing them has been constantly increasing. As a result more than 30 percent of the installed equipment is operated from 10 to 20 years, and that means that the assets share of the production assets is becoming obsolete and becoming not only relatively ineffective, but also relatively unprofitable.

The examples that have been given attest to the need to develop the scientific and practical foundations of the administration of scientific-technical progress in branch production as a very important link in the national economy. Moreover, the many years of experience indicate that the increase in the effectiveness of scientific-technical progress depends directly upon the rates of dissemination of its achievements in the national economy.

In the sphere of the production ties and relations, a role of no small importance belongs to the incentive-producing factors: both the material and the psychological self-interest of the labor collectives in the introduction of the latest achievements of science and technology. Characterizing the influence of machine production upon man, K. Marx wrote that "modern industry never considers and never treats the existing form of production process as the final one. . . . By means of the introduction of machinery, chemical processes, and other methods, it constantly carries out revolutions in the technical base of production, and also in the workers' functions. . . ." (K. Marks [Marx] and F. Engel's [Engels], *Soch.* [Works], Vol 23, pp 497-498).

Man's production functions at the present-day stage also change constantly in conformity with the development of the means of labor and the technological methods

of production and control. Therefore the acceleration of scientific-technical progress requires first of all the formation of that system of control that would regulate and stimulate the process of creating new technology and its introduction into the national economy.

The Basic Directions in the Development of the USSR National Economy in 1976-1980, which were approved by the 25th CPSU Congress, mentioned the need to improve the control of the national economy for purposes of the more complete use of the advantages and capabilities of the economy of mature socialism, the need to intensify the comprehensive effect of the plan, the economic levers and incentives, and the entire control system upon the acceleration of scientific-technical progress, the improvement of the quality of output, and the increase in the effectiveness of social production. A major step in implementing the decisions of the congress was the adoption of the decree of the CPSU Central Committee and the USSR Council of Ministers, dated 12 July 1979 and entitled "Improving the Planning and Intensifying the Effect of the Economic Mechanism Upon Increasing the Effectiveness of Production and the Quality of Work."

The 26th CPSU Congress also emphasized the need for the further economic development of society and for profound qualitative shifts in the material-technical base on the basis of the acceleration of scientific-technical progress, the intensification of social production, and the increase in its effectiveness. Proceeding from this need, the 26th CPSU Congress defined the specific tasks in the development of science and technology. They include: the development and implementation of a comprehensive program for scientific-technical progress, comprehensive scientific-technical programs, and programs for the resolution of the most important scientific-technical problems; the intensification of the mutual ties between science and production; the substantial reduction of the amounts of time needed to create and assimilate new technology; the expansion of the automation of design and construction-planning and scientific-research projects with the application of electronic computers; the development of production and the broad application of automatic manipulators (industrial robots); the creation of automated shops and plants; the increase, within the optimal limits, of the unit capacities of machinery and equipment with the simultaneous decrease in their dimensions, the amount of metal needed to produce them, their energy consumption, and the reduction in the cost per unit of final beneficial effect; the broader application of technological processes requiring few operations, with little or no waste products; the development of the production of superpure and high-resistant metals, new polymer and compositional materials and articles from them with a series of assigned properties; etc.

Our country entered the 1980's in possession of a mighty economic and scientific-technical potential, and highly trained workers, specialists, and scientists in all branches of the national economy. That makes it possible to resolve successfully the vitally important national-economic and social tasks, to develop and carry out comprehensive programs for the development of various branches, areas, and directions that are planned for 10-15 or more years, and to create very large-scale territorial-production complexes.

The intensification of the economy is a completely natural tendency in the development of the national economy under the conditions of mature socialism. At the same time it is necessary to take into consideration a number of objective

factors in the country's economic growth, which increase the importance of the intensification of production and the increase in labor productivity over the long view.

We have in mind, first of all, the demographic situation, which during the forthcoming years is developing in a manner which, for the country as a whole, is extremely strained. Today practically the entire able-bodied population in the country is working or attending school. The share of those persons employed in the national economy comes to approximately 92 percent of our country's able-bodied population. But in the RSFSR, Belorussia, the Baltic republics, and the Ukraine their percentage is even higher. Neither today nor in the long view can agriculture be viewed as a source of manpower for the other branches of the national economy, inasmuch as, in a number of instances, the age structure of agricultural workers has been violated: among them there is a considerable share of persons of pre-retirement and retirement age and an insufficient share of young people.

Analysis indicates that the increase of the labor resources in 1981-1985, as compared with the 10th Five-Year Plan, will be reduced to less than one-third and in 1986-1990 that process will continue. If one considers the ever-increasing need for manpower in the nonproduction sphere and trade, it will prove that, practically speaking, there will be no influx of manpower into material production. Consequently, the increase in the production of industrial output, and the volume of construction and installation operations and transportation shipments must be carried out by means of an increase in labor productivity on the basis of its scientific organization and the acceleration of technical progress.

The need for the further development of the Soviet economy under the conditions of an acute shortage of labor resources confirms the importance of the complete introduction of the latest achievements of world and domestic science and technology, which provide a great saving not only of material expenditures, but primarily of labor resources. In other words, there is a need for those technical decisions which will make it possible to achieve a sharp increase in labor productivity and to eliminate manual operations.

The intensification of the role played by the areas of Siberia, the North, and the Far East as a source of the power resources and most of the raw-materials resources for the development of our country's economy and foreign-trade operations will require an increase in the government's expenditures for the extraction and transporting of these resources to the places of consumption. The situation is complicated by the fact that the geological and mining conditions for the deposits that are to be exploited are becoming worse and, consequently, they require considerable financial and material means to compensate for the natural reduction in the production of mineral resources. This pertains primarily to the petroleum industry, which is distinguished by the large amounts of capital and materials that it requires. The same situation is developing in ferrous metallurgy as a result of the decrease of metal content in the ore.

All this requires the taking of urgent steps to build up the rates of scientific-technical progress. The efforts of the scientists and specialists must be concentrated on the key problems in the development of the national economy, on the implementation of the large-scale scientific-technical programs that are capable of effecting a sharp increase in the productivity of social labor.

Proceeding from the decisions of the 26th CPSU Congress and the decree of the CPSU Central Committee and the USSR Council of Ministers, dated 12 July 1979, USSR Gosplan and GKNT [State Committee for Science and Technology] foresee for 1981-1985: the rise in the technical level of production; the taking of all steps to improve the quality and structure of output being produced; the assimilation of fundamentally new types of technology and technological processes and the saturation of the branches of the national economy with them; the expansion of research and development in the most important directions of scientific-technical progress.

During the present five-year period it is planned to introduce into production approximately 19,000 new types of machinery, equipment, attachments, and other output (as compared with 17,5000 in 1976-1980). The draft version of the 1982 plan provides for the assimilation of a broader variety of new and very important types of output and progressive technological methods -- more than 800 types of new articles and more than 3000 assignments for the introduction of technological processes, means of mechanization and automation. A large volume of work to achieve the technical improvement of production and to improve the quality of output is also being carried out in accordance with the plans for the branches, republics, associations, enterprises, and organizations. During the five-year period it is planned to remove from production more than 10,000 different types of obsolete technology and, instead of them, to produce new or modernized articles.

One of the directions in technical progress in the improvement in the quality of the output being produced. The share of the output with improved category of quality will, according to plan, be increased in 1985 to 20.5 percent (as compared with 15.4 percent in 1980), and in a number of branches of industry, to 45-50 percent.

There will be an increase in the rates of automation of production. In the 11th Five-Year Plan it is planned to introduce more than 2700 automated systems for controlling the technological processes, and more than 7400 computer and control complexes on the basis of microprocessors and minicomputers. The saving from the reduction in the net costs of production as a result of the rise in the technical level of production in the national economy will be, during the current five-year plan, approximately 17.5 billion rubles (as compared with 15 billion rubles in the previous five-year plan); in conventional terms, there will be a freeing of approximately 12 million workers. The capital-labor ratio will increase in industry and agriculture, respectively, by 34 and 44 percent.

In industry one will observe the growth at outstripping rates of the capital-labor ratio in ferrous and nonferrous metallurgy, the petroleum-refining, chemical, and petrochemical industry, machine-building, and metal working.

The draft versions of the plan stipulate the expansion in the introduction of progressive labor-saving and material-saving technological processes -- electronic ray, laser, electro-erosion, plasma-mechanical. Beginning in 1982, the draft version of the plan established assignments for the manufacture of parts with gas-thermal coatings. In 1985 industry is supposed to produce approximately 32 million such parts with the spraying of more than 3,500 tons of metal onto them. The improvement of technological processes in machine-building will make it possible to improve the efficiency of metal rolling to 0.78-0.79 as compared with 0.73 in 1980.

In the 11th Five-Year Plan, provision is made for basic assignments for 170 scientific-technical programs, including 41 comprehensive target programs; their final task is the extensive implementation in the national economy of the most significant and most effective scientific-technical achievements. Their use will assure within the near future a substantial increase in the effectiveness of production and the quality of output. One hundred twenty eight programs are oriented at the resolution of very important scientific-technical problems that are linked with the development of new technical means, the creation of a scientific-technical backlog for the subsequent period in the most promising directions in science and technology. For the programs as a whole it is planned to create more than 400 objects of new technology and technological processes, approximately 60 percent of which will be assimilated during the current five-year plan.

The 12 February 1982 decision of the Board of USSR Gosplan approved the Comprehensive Program for the Development of the Mechanization and Automation of Hoisting-Transporting, Loading-Unloading, and Warehouse Operations in Industry, Agriculture, Construction, Transportation, Trade, and Material-Technical Supply and Sales. This program is the basic prerequisite for the resolution of that very important social and economic task -- the liberation of man from heavy manual labor and the reduction in the number of persons employed in those operations. The implementation of the program is currently being carried out in a planned procedure.

In the 11th Five-Year Plan, simply as a result of the implementation of the scientific-technical programs, the following are planned: the conventional freeing of more than 3 million workers; the reduction in the number of workers employed in manual labor by 900,000 persons; a saving of 14 billion kilowatt-hours of electrical energy, more than 6 million tons of ferrous metals, and approximately 200,000 tons of nonferrous metals. In addition, the comprehensive target programs provide for the further expansion in the scope of creation of new types of technology.

The section "Scientific-Technical Problems to be Developed by the Soviet Union in Cooperation with the CEMA Member Countries" provides for the preparation of 12 scientific-technical programs on a multilateral basis and 40 programs on the basis of bilateral cooperation with the CEMA countries.

The scientific-technical programs encompass practically all the branches of the national economy. This is attested to the following figures:

	<u>Total number of programs</u>	<u>Including target programs</u>
Power engineering, electrical engineering	10	4
Fuel branches and geology	13	6
Chemistry, petrochemistry	16	7
Metallurgy	13	2
Machine-building and metal-working technology	22	2
Timber, wood-processing, and paper-and-woodpulp industry	4	1
Light, food industry, consumer goods	8	1

[continued on next page]

Computer technology and communication	15	4
Agriculture and reclamation	18	7
Transportation	8	1
Construction	10	1
Protection of the environment	7	-
Scientific organization of labor	11	-
Other	15	5
Total	170	41

In conformity with the existing system of planning, USSR Gosplan, jointly with GKNT and the Presidium of the USSR Academy of Sciences during the past three years prepared and conducted seven sessions, which considered the fulfillment of scientific research projects by organizations of the USSR Academy of Sciences and higher schools and the implementation of the obtained results in the practical situation. The participants in the sessions included administrators of ministries and departments, prominent scientists, designers, and administrators of plants and associations. Before each session, large special-topic exhibitions were organized in the USSR Gosplan building, dealing with the questions to be discussed. Those exhibitions showed the completed developments being recommended for introduction into the national economy. They were visited by more than 30,000 specialists.

By decisions of a joint session, the divisions of USSR Gosplan and the administrations and divisions of GKNT were given the responsibility, together with the USSR ministries and departments and the Gosplans of the union republics, of considering the proposals of the USSR Academy of Sciences, its branches, and scientific centers for introducing into the national economy in 1981-1985 and over the long view until 1990 the completed scientific-research projects. The proposals were sent to 75 ministries and departments and to the appropriate divisions of USSR Gosplan and GKNT for taking them into consideration when preparing the annual plans. The following are some of them.

The handling capacity of the gas mainlines that are currently being constructed out of the 1420-mm pipes that we have at our disposal, which have optimal pressure parameters of 75 atmospheres, does not completely conform to the increasing requirements. The problem of transferring Tyumen' gas for large distances most effectively can be resolved on the basis of the broad use of reliable, high-strength pipes, including the multilayer ones created by the Institute of Electrical Welding imeni Ye. O. Paton, UkSSR Academy of Sciences. Computations indicate that the use of such pipes in the indicated diameter, when operating with increased pressure, makes it possible to transmit along the gas pipeline approximately 50 billion cubic meters of commercial gas per year, which almost doubles the handling capacity of the gas pipelines being constructed. This will make it possible to obtain a tangible saving during the next decade.

Many enterprises have a considerable overexpenditure of fuel. The fight to save fuel must become a nationwide matter. The five-year plan provides for a saving of 205 million tons of standard fuel, as compared with the 125 million tons that were saved in the 10th Five-Year Plan. Here too a factor that can exert a decisive influence is the introduction of the achievements of science and technology: progressive designs of furnaces, burner devices, technological

methods for using secondary fuel and the heat contained in the exhaust gases. Units for the high-temperature superheating of the air make possible a considerable reduction in the expenditure of coke in blast-furnace production and also make it possible to achieve an increase in productivity and to reduce the production costs by almost 30 percent while improving the quality of the pig iron, and also to carry out the broad development of the processes of direct restoration of iron and nonblast-furnace metallurgy. An experimental-industrial unit for high-temperature superheating, with a capacity of 1000 cubic meters, will be activated in 1983.

In the production of polymer materials, the ones that are most widespread are polyethylene, polypropylene, polyvinyl chloride, and polystyrene. The products that serve as raw materials for producing them are petroleum hydrocarbons -- gasoline and kerosene and gas-oil fractions, and liquefied gases. One of the most widespread methods for increasing the production and reducing the costs of polymer materials has been, in recent years, the application of the method of mixing the finished polymer with various, relatively inexpensive mineral fillers: perlite, tuff, metallurgical slag, glass fiber, etc.

A composition containing approximately 90 percent of perlite, after stamping and sintering, makes it possible to obtain high-grade noncombustible heat-insulating and sound-insulating slabs that are the equal in properties to slabs containing 65-70 percent of expensive foamed phenoloformaldehyde resin. On the initiative of USSR Gosstroy, Mosoblispolkom, and USSR Minpromstroy materialov, an experimental-industrial unit has been constructed at the Stroyperlit Combine for the purpose of obtaining this material, and slabs from it. The unit has a capacity of 50,000 cubic meters a year.

The national economy's need for these kinds of materials comes to millions of cubic meters a year.

A composition containing from 30 to 60 percent of filler is a structural material which, according to its physical-mechanical properties, is at least equal to pure polymer and which can be used on a broad scale for manufacturing pipes, fittings, sanitation-engineering, and fractionation articles, and various types of packing materials and consumer goods.

According to a preliminary estimate, when using this method to produce 1.5 million tons of structural materials and up to 10 million cubic meters of heat-insulating materials, the expenditure of petrochemical raw materials and petroleum fuel can be decreased by almost 10 million tons a year (in terms of petroleum), and this will make it possible to save considerable volumes of capital expenditures. In addition, the need for steel pipes will be reduced by 5-6 millions tons a year.

In the chemical industry there has appeared a group of new polymer structural materials with unusual properties, including polycarbonates, polybutylene terephthalates, polyformaldehydes, caprolon, and polyamides, which replace high-alloy steels and nonferrous metals. They can be widely used in the radio electronic, electrical-engineering, and automobile industries, and in instrument-building and machine-building. Many of them have high resistance to wear and tear and good strength properties, and operate at low and high working temperatures.

A ton of these structural thermoplasts replaces 5-6 tons of rolled steel and 6-7 tons of copper or bronze, saves the labor of hundreds of people as a result of the low labor-intensity of manufacture, and yields an economic benefit of 6000-8000 rubles. The chief task of the Ministry of the Chemical Industry and the planning agencies is the immediate creation of the capacities that are necessary to satisfy the needs for these materials in the national economy, in order to reduce the expenditure of expensive, scarce high-alloy steel and nonferrous metals.

A method that is of great importance is the method of radiation modification of polymers, which is carried out with the aid of charged-particle accelerators. Radiation technology provides the opportunity to obtain materials with increased technical and operational features. For example, articles made of polyethylene, after being radiated, can operate at a temperature of 135° C instead of the usual 80°. The properties acquired by them make it possible to employ heat-shrinking polymer films and other articles for the most varied purposes (from the packaging of consumer goods to the sealing of special-technology units, for the corrosion protection of petroleum and gas pipelines), while saving from 15 to 40 percent of the initial polymer.

The role of new materials in accelerating scientific-technical progress has been growing from year to year. Their development, assimilation, and introduction into production, to a decisive degree, determine the creation of reliably operating nuclear reactors employing fast neutrons, high-temperature economical gas turbines and jet aviation engines, especially compact microelectronics, electronic computer memory systems, superconducting electrical-transmission lines, solar batteries, highly effective electrical-current batteries and electrochemical generators, mono- and polycrystals, and various types of instruments and tools. As a rule, the requirements made of modern new materials are very great. Their creation requires the unification of the efforts of physicists, materials specialists, chemists, engineers, metallurgists, and other specialists.

When speaking about the situation with regard to metals and materials, one must direct attention to the need to develop powder metallurgy. The manufacture of materials and articles out of metal powders makes it possible to increase the reliability and service life of parts for machinery and instruments that operate under conditions of high speeds, temperatures, and loads, and aggressive environments and radiations. The application of the method of powder metallurgy increases labor productivity by a factor of 2-3, and reduces capital expenditures. As a result of the conversion of the production of 1000 tons of articles intended for general machine-building use to the method of powder metallurgy, there is a saving of 1.3-2 million rubles and 1500-2000 tons of metals, a freeing of a considerable number of metal-working machine tools and the personnel who service them, and the use coefficient of the metal achieves 0.95-0.98.

A comprehensive target scientific-technical program has been prepared for the 11th Five-Year Plan. The implementation of that program is supposed to lead to major shifts in this important area of development of technology. The program provides for: the expansion and improvement of the quality of powder materials and articles made from them; the development and assimilation of specialized technological equipment and means of automation for powder metallurgy and the industry producing composition materials. The lead organizations have been

specified for various assignments in the program; the types of equipment and instruments have been coordinated; the volumes of forthcoming production of powders and articles made from them have been planned (an increase by a factor of 3.2 as compared with 1980); and the interaction among the plants, design bureaus, and research institutes has been refined.

The amount of work that will have to be done is large. The Minstankoprom enterprises alone, during the current five-year period, are supposed to produce hundreds of highly-productive automatic forging and pressing units and specialized presses in more than 40 models and modifications. In cooperation with the country's scientific organizations, they are also supposed to create experimental-industrial models of automatic presses for hot punching, new gas hydrostats, and to assimilate the series production of the previously created models. Many branches are organizing designing and construction-planning subdivisions, specialized production entities, and are building shops and plants. A total of approximately 200 organizations in 45 ministries and departments are participating in the fulfillment of the program.

Failures to meet the deadlines in carrying out the work, especially with regard to the interbranch ties and the previously coordinated mutual actions and shipments, are fraught with undesirable consequences. Therefore it is important for the ministries and departments, and their organizations and enterprises which are participants in the program, to observe precisely the jointly established deadlines for fulfillment of the assignments.

In order to increase the effectiveness of production, factors which are of tremendous importance are the efficient use of metal structuralis and the economizing of material resources. I would like to dwell on one example in this area -- the fight against metal corrosion. Every year the losses from corrosion, which leads to the premature going out of commission of equipment, means of transportation, and structural elements in buildings and structures, exceed 14 million rubles; approximately 15 million tons of metal become scrap prematurely.

In the chemical industry the direct losses from corrosion of equipment exceed one billion rubles. In the petroleum and gas industry, the average service lives of the equipment and structures are reduced, as a consequence of corrosion destruction, to one-third to two-fifths of the normative service lives. Losses of agricultural technology as a result of corrosion reach 700 million rubles a year. But the use of the developed progressive technological processes, methods, and means of anticorrosion protection does not correspond to the needs for them.

A factor of great importance for increasing the labor productivity and improving the quality of output is the introduction of such technological processes as volumetric-superficial tempering, and plasma-mechanical, and electrochemical treatment. Projects that can serve as a graphic example are those in the area of plasma-mechanical treatment of metals and the obtaining of bimetallic rolled metal and articles by the method of plasma surfacing and spray-coating, which are being carried out in one of the institutes in the electrical-engineering industry with the participation of individual metallurgical and machine-building plants. When this method is used to treat castings and forgings with a mass of up to 40 tons, the speed of cutting is increased by a factor of up to 40, the

durability of the metal-cutting tool is increased by a factor of 5-6, and there is a considerable reduction in the need for heavy and one-of-a-kind metal-cutting equipment. The opportunity also opens up for the broad application of wear-resistant coatings for the purpose of strengthening large-sized items of metallurgical, power-engineering, shipboard, and other equipment operating under especially difficult conditions.

Let us consider yet another question -- the question of petroleum. Recently we have sensed definite complications in meeting the increasing needs of our national economy for petroleum and petroleum products. The fact of the matter is that new petroleum and gas deposits are being discovered in areas that are increasingly inaccessible, the assimilation of which requires, in addition to the funds for oilfield equipment, extremely large-scale capital investments in urban construction, the creation of transportation ties, the construction of petroleum pipelines of considerable length, etc.

The search for new deposits in the old petroleum areas is linked, as a rule, with drilling to greater depths. Therefore the increase in the degree of use of the petroleum reserves in the already discovered deposits takes on special importance as a means of converting the reserves from potential ones into extractable ones. During the current five-year plan, new methods of increasing the petroleum yield must be introduced in various petroleum-producing parts of the country, including in those areas with a decreasing production of petroleum.

Despite the exceptional importance of the new methods of increasing the extractable reserves and intensifying the production of petroleum, Minnefteprom and the other ministries and departments have not been devoting sufficient attention to their introduction on a broad scale. An example of this can be provided by the state of the petroleum industry in Azerbaijan SSR. During recent years the production of petroleum has been decreasing here, despite the existence of considerable reserves for increasing it. It is necessary to accelerate the projects involving the introduction of secondary and tertiary methods of extraction, which assure an increase in the petroleum yield from the strata, and also to accelerate the production of petroleum on the shelf of the Caspian Sea.

I would like to draw attention to still another problem which, in the light of the decisions of the May 1982 Plenum of the CPSU Central Committee, is taking on special importance -- the fight against losses of agricultural products. Speaking at the November 1978 Plenum of the CPSU Central Committee, L. I. Brezhnev said, "Soviet citizen can understand the difficulties that are linked with weather conditions, but they cannot accept and do not want to accept as an explanation for the existing difficulties any instances of poor business practices, irresponsibility, or sloppiness. That is why we today say with complete justification that the question of losses of grain, vegetables, fruit, and cotton is not simply an economic question. It is also a large political question. It exerts a direct effect upon the mood, upon the labor activity rate of Soviet citizens" (L. I. Brezhnev, *Leninskii kursom* [On Lenin's Course], Vol 7, Moscow, Politizdat, 1979, p 533).

According to data provided by USSR Minsel'khoz and the scientific-research institutes, the annual losses of grain during the bringing in of the harvest, the

transportation, and storage operations, constitute tens of millions of tons and a large amount of fodders. Because of spoilage, the customers fail to receive a large amount of potato harvest that has been brought in, and a large amount of fruits, vegetables, and products of animal husbandry. A considerable amount of sunflower seeds, sugar beets, and a large amount of other produce is lost.

One can no longer be reconciled to the large losses of agricultural products. A search for ways to eliminate losses of agricultural products is being carried out in various directions: the storage and transportation in a liquid-nitrogen environment, in a regulated gas environment, in selective-gas polymer films and containers, the use of electron-ion technology, active ventilation, and the use of cold, etc. The experiments that were conducted in a number of oblasts and republics in the country have yielded good results.

Research projects which are worthy of interest are those at the Institute of Botany imeni N. G. Kholodnyy and the Institute of Plant Physiology, USSR Academy of Sciences, which have been carried out jointly with the Sakhar Scientific-Production Association, for the development of a new and effective method of storing sugar beets with the aim of reducing the losses of sugar. With this method, the sugar beets, as they are being loaded into the storage facilities, are treated with a solution of a chemical substance.

Important projects for increasing the effectiveness of production and processing of agricultural products are being carried out by the UkSSR Academy of Sciences. They have created and assimilated a technological system for the manufacture of fruit-glucose powders from production by-products -- apple squeezings -- which system makes it possible to obtain valuable food products from them. The mass development of such powders from various fruits and vegetables will provide the opportunity to use them to replace as much as one million tons of sugar and other valuable products and to obtain a saving of more than one billion rubles a year.

A factor of great importance for the grain preservation rate is the use of electron accelerators at elevators. Promising results have been provided by experiments carried out by associates of the Siberian Branch of the USSR Academy of Sciences in using an electronic beam in the fight against pests that are destroying the grain reserves, which pests cause a tangible loss to the harvest, especially in the warm parts of the country. Radiation treatment of the grain has proved to be considerably cheaper than chemical treatment, and -- what is very important -- more productive. The accelerator can irradiate in one hour as much as 200 tons of wheat, barley, or rice. The absolute safety of this method with regard to the nutritional properties of the grain has been proven.

All these and other questions are extremely vital ones for increasing the effectiveness and for intensifying agricultural production. The appropriate assignments must be included in the national-economic plans.

This is far from a complete list of the problems in the development of science and technology, the resolution of which will reduce the expenditures per unit of output and will reduce its net cost and production costs, will improve the use of the material and technical resources and edible agricultural products, and, in the final analysis, will increase the effectiveness of social production. All

of them, to one degree or another, are included in the five-year plan and in the annual plans, and this makes it possible to carry out the more precise administration of scientific-technical progress in the country and to use its influence upon effectiveness. However, not all the proposals made by the Academy's organizations, or the scientific-research, construction-planning, and technological institutes of the ministries and departments, or the institutions of higher learning are being taken into consideration in the plans. The reasons are the lack of completeness of the elaborations; the fact that the branches of the national economy lack the capacities and resources for the introduction of the completed projects, and that there are no production orders from the customers for the new output, for various reasons.

As a whole the steps taken by USSR Gosplan, GKNT, the USSR Academy of Sciences, and the ministries and departments for the use of the achievements of science and technology in the national economy are yielding considerable results. There has been an increase in the rate of activity at the Academy's institutes and at institutions of higher learning for the purpose of introducing into industry the results of the research projects and elaborations that have been completed by them. There has been a strengthening of the contacts among scientists, the workers at planning agencies, ministries, departments, and industry. It is necessary to continue following the line of controlling the effect of scientific-technical progress upon the development of the economy.

Of course, one cannot fail to be disquieted by the circumstance that, in certain branches of the national economy, the five-year plan is being fulfilled with tension, and for certain items on the plan the assignments for 1982 are lower than have been stipulated for the five-year period. There is a rather large number of reasons for this: the insufficient rates of scientific-technical development; the unsatisfactory organization of labor; the violations of planning and production discipline; the restraining of the activation of production capacities, especially in the raw-materials branches and heavy industry. A large number of the unresolved problems are linked with the operation of transportation, the branches of the fuel and energy complex, metallurgy, the chemical and petrochemical industry, machine-building, and agriculture.

In order to increase the effectiveness of social production, a factor of great importance is its automation. At the present stage, the control of enterprises or a branch would be inconceivable without systems of automation that have been created on the basis of new-generation electronic computers.

At the present time one observes in the national economy the constant improvement of the structure of the multipurpose computer pool as a result of the increase in the share of the machines with faster action and better-developed peripheral equipment.

As a result of the outstripping development of the microprocessor technology and the production of systems with digital programmed control of metal-cutting equipment, industrial robots and manipulators, controllers, and mini- and micro-computers, which will be broadly used as built-in components of various machines, pieces of apparatus, devices, and technological processes, the pool of computer technology during the years of the 11th Five-Year Plan will be considerably renewed and increased in size.

From year to year one has noted the increase in production of industrial robots. Whereas in 1981, 3700 of them were manufactured, in 1982 their production will be 4200, and in 1983, 7500 (as against the 5400 stipulated in the five-year plan). The production of attachments and means of automation also is exceeding the indicators specified by the five-year plan; in 1983 the volume of their output will constitute 4898 million rubles, as compared with the 4865 million rubles according to the five-year plan.

The rapid increase in the production of computer technology has been accompanied by its broad introduction at enterprises in various branches of industry. This, in its turn, has been changing the operating conditions in production, the social and psychological climate in the sphere of administration, and increasing the economic effectiveness of the functioning of the enterprises.

In the USSR electronic computers are in use at thousands of plants, associations, shops, and production sectors, for the purpose of controlling material-technical supply, for making economic and engineering computations, etc.

The basic peculiarity of the present-day stage is the complete automation of the control of the enterprise, which automation encompasses both the technical control of the technical processes and production, and the organizational-economic control of the enterprise's subdivisions. The experience in the application of computer technology in the national economy demonstrates its high effectiveness.

The basic attention when developing plans for the introduction of computer technology was concentrated in the most effective areas of its application and in reflecting the obtained results in the planning and settlement; physical and value indicators. Something, for example, that was subordinated to this goal when preparing the 11th Five-Year Plan was the consideration of the construction-planning resolutions of the ministries, departments, and union republics, which consideration was carried out at the Computer Technology Division, USSR Gosplan, with the participation of the administrators of the branch divisions, as well as the economic-planning and technical administrations of the ministries. As a result, physical and value indicators were formulated for practically all the industrial ministries, which indicators gauge the effectiveness of the application of computer technology in the branches of the national economy: indicators for the increase in profit, including that obtained as a result of the production costs by individual elements of material and labor expenditures; for increase in labor productivity and the reduction of the number of employees; for additional increase in capacities and production of output; etc.

The indicators stipulated in the plan for the introduction of computer technology and the resources that were allocated for those purposes made it possible to determine the saving which can be taken into consideration on a planned basis as a result of the increase in profit. It should be noted that we are discussing here not an arbitrary effectiveness, but the additional profit that is taken into consideration in the plans. For the national economy as a whole, the repayment rate for the capital investments used for the purchase of means of computer technology does not exceed three years.

In the 11th Five-Year Plan the bulk of the increase in profit as a result of the application of computer technology (60-70 percent) provides a decrease in the

production costs, primarily as a result of the saving of material resources and wages, the share of which in machine-building is, respectively, 28 and 42 percent, and in the branches of the processing industry, 78 and 6 percent. For certain ministries in machine-building and metal-working, the saving from the reduction in the production costs, which saving is providing by the application of computer technology, comes to 10-12 percent of its total volume, and in individual branches of heavy industry (for example, in power engineering), more than half.

Among the most effective areas for the use of computer technology one must include its application in branches of heavy industry and in transportation. For example, in ferrous metallurgy an increase in steel production as a result of the application of automated control systems at the basic technological processing areas will be 800,000 tons, and the production of rolled metal and pig iron, 700,000 tons each.

In the petroleum and gas industry the use of computer technology in the planned volumes will make it possible to produce 31.4 million tons of petroleum, and in the gas industry. 21 billion cubic meters of gas. The use of electronic computers in geology makes it possible to study the geological structure of deep deposits that were previously inaccessible, the exploitation of which will result in an increase in the extractable reserves of petroleum and gas.

By taking steps to automate the planning and control of shipments on rail transportation, it is planned to guarantee by 1985 a reduction in the railroad car turnaround time by six hours, which is equivalent to 33 percent of the total reduction in their turnaround time and to the freeing of 42,000 railroad cars. In construction, automatic computations are being broadly used when preparing schedules for the centralized delivery of concrete mortar and other building materials to the construction sites.

USSR Goskomsel'khoztekhnika, using computer technology, considerably improved the rate of supplying the machine-tractor pool with spare parts. By 1985 it is planned to complete the work of automating the computations in the system of material-technical supply of agriculture: the creations of an automated control system will provide the opportunity to take into consideration and to process on the computers approximately 90 percent of the material resources concentrated at 11,200 large-scale warehouses in the oblast and republic administrations of Sel'khoztekhnika. This will make it possible, on a time-responsive basis, especially during the period of the sowing and harvesting operations, to satisfy the requisitions for spare parts when repairing the machine-tractor pool and to increase the tractor readiness coefficient from 0.7 in 1980 to 0.9 in 1985; trucks from 0.177 to 0.84; and grain-harvesting combines from 0.66 to 0.69. This is equivalent to providing agriculture with an additional 56,000 tractors, 73,000 trucks, and approximately 34,000 combines. USSR Gosplan is continuing the work of defining and accounting for the effectiveness of the application of electronic computers in the planning indicators for agriculture, trade, material-technical supply, and other branches of the economy.

The introduction of automated control systems in industry reduces the production costs, and improve the technical-economic indicators pertaining to the operation of the machinery and equipment, and this, in the final analysis, is one of the

factors influencing the increase in labor productivity and the effectiveness of production. For a number of ministries, in the overall increase in labor productivity the share of this factor constitutes 10-15 percent of the assignments established for this indicator as a whole. In industry alone, the planned measures for the introduction of electronic computers and automated control systems make it possible to foresee the conventional freeing of 200,000 workers.

It is necessary to direct attention to the fact that the effectiveness of the application of computer technology would be considerably higher if there were a balanced guaranteeing of the national economy with peripheral and service equipment and if there were better use of the electronic computers. Beginning in 1983, the assignments for computer technology will be put into an independent section of the national-economic plan. Thus, favorable conditions have been created for the further improvement of the planning and control of the development and introduction of computer means into the country's national economy. This will intensify its influence upon the effectiveness of social production.

The prompt resolution of the questions that have been considered will undoubtedly cause profound positive shifts in the development of many branches of the economy. This will be promoted by a rise in the proficiency level of the workers, an improvement in the technical equipping of the scientific organizations and of production, the intensification of the labor activity rate, and the unfolding of the creative initiative of the Soviet citizens. In order to achieve the goals that have been set, it is necessary to assure the more energetic and more active use of the levers that we have at our disposal, and the steady improvement of the mechanism of planning and control.

In the long view there must be a considerable increase in the targeted nature of planning and control of the development of science and technology as a result of the organic tie between the assignments of the long-range and annual plans for the introduction of new technology, on the one hand, and the scientific-technical programs that are being developed, on the other hand. Obviously, it is necessary to consider the question of the changeover from the planning of individual assignments that are formulated according to the branch principle, to the planning of a complex series of the most important, interrelated measures in the corresponding programs to be executed by various executors, and aimed at the attainment of the final result. This will make it possible to monitor continuously at the USSR Gosplan level the implementation of the most important target tasks and, if necessary, to make the appropriate decisions. The entire complex of measures involving the creation, assimilation, and introduction into the national economy of scientific-technical innovations, automated control systems, and computer and microprocessor technology should be viewed as a single system that guarantees the attainment of the final socioeconomic goals -- steady rates of growth in production, labor productivity, and labor effectiveness.

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PATON ON RESEARCH CONTRIBUTIONS OF UKRAINIAN ACADEMY OF SCIENCES

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[Article by Academician Boris Ye. Paton, president of the UkSSR Academy of Sciences: "Converting Science into a Direct Productive Force"]

[Text] Academician B. Ye. Paton is president of the UkSSR Academy of Sciences, twice Hero of Socialist Labor, director of the UkSSR Academy of Sciences Institute of Electric Welding imeni Ye. O. Paton, and a specialists in the field of metallurgy and the technology of metals.

Under developed socialism, the well-known tenet of the classics of Marxism concerning the conversion of science into a direct productive force manifests itself in the thorough integration of science and production. Extensive utilization of the advances in science has now become the main condition for raising labor productivity, for the intensification of social production, and for significant changes in the structure of the economy and in the sphere of the population's spiritual life.

The 26th CPSU Congress attached special importance to the further development and acceleration of the progress in science and technology, to a closer link between science and production. In following this important theoretical tenet the task, from our point of view, is to find the right ways and means of its fullest possible realization at every stage in the development of Soviet society.

At least three important aspects can be distinguished of the process of converting science into a direct productive force under present-day conditions.

Of great importance for the realization of this process is first of all the utilization of the latest results in basic research to create the prerequisites for profound qualitative changes in society's productive activity. The discovery of new forms of using energy, of enormous possibilities to concentrate energy and to increase and reduce velocities, temperatures and pressures, serves as the basis of perfecting the means of production and instruments of labor, and of organizing new types of production that are not simply expansions of the previous experience.

The second aspect of this process is the progressing tendency of the shortening of the time between a scientific discovery and its practical application. Now only years, and not centuries or decades, separate many scientific discoveries from their practical application in production. The lag between the invention

and the series production of the radio and of the electron tube was 30 years, but the lag between the discovery and practical application of solar batteries and masers was only 3 years.

The elapsed time from obtaining a scientific result to its practical application is now one of the basic indicators of the effectiveness with which the entire system of science-technology-production functions. If advanced ideas are not incorporated within the shortest possible time in new equipment, materials and technology, then progress in production slows down significantly, and the new idea itself becomes obsolescent. Experience shows that the service life of new equipment or of a new technology, under the present rapid development of the productive forces, is only 6 to 8 years and will be even shorter in the future.

Expansion in every possible way of the scale on which new developments in science and technology are applied in practice is likewise an important aspect of the conversion of science into a direct productive force. The revolutionary changes in science have generated a powerful stimulus to develop new equipment and technologies that have found wide practical application within a short time. At the same time, however, it cannot yet be said that the potential of new equipment and new technologies is being fully utilized. A very important task, therefore, is the selection and extensive realization of the most advanced and most promising innovations. In this way it is possible to raise significantly the technical level of production and labor productivity in the various sectors of the economy.

Acceleration of the progress in science and technology requires close cooperation between scientists and production workers. The first of the mentioned aspects is ensured basically through the efforts of scientists. The second aspect requires about equal effort from both sides. But the third aspect--expansion of the scale on which innovations are applied to practice--depends more on the production workers.

Conversion of science into a productive source is a many-sided and dynamic process. One could hardly overestimate its role in creating the physical production base of communism, in transforming socialist social relations into communist ones, and in shaping the new man. The growing contribution of science to the economic, social and spiritual life of Soviet society is clear proof of its growing effectiveness. Thus the effectiveness of science lies not only in the practical application of innovations and in the resulting savings of material resources and manpower, expressed in value terms. The concept of effectiveness is much broader. It includes the great scientific significance of the obtained results, and their influence on the development of science itself, on the technical level of production, and on the solution of sociopolitical problems.

How is the UkSSR Academy of Sciences raising the effectiveness of its scientific research?

I will dwell mainly on those activities of the Academy that are related to the mentioned aspects of the process of converting science into a direct productive force.

The main task of the UkSSR Academy of Sciences, similarly as of the academies of sciences in the other republics, is to develop basic research. Without basic

research, there can be no great scientific discoveries. Basic research provides insight into what future production will be like, and it opens new possibilities for scientific, technical and social progress.

Starting out from the principle of the unity of Soviet science, at the institutions of the UkSSR Academy of Sciences we are not attempting to develop every single direction of scientific research without exception. Instead, manpower and resources are concentrated on those directions of scientific research in which significant results have already been achieved or are expected to be achieved in the near future.

Basic research by scientists of our Academy has contributed new knowledge of animate and inanimate matter and has served as the basis for the successful solution of a number of problems for the intensification of social production. Several years ago, for example, our physicists discovered the phenomenon of turbulent heating and anomalous resistance in plasmas. This phenomenon became the scientific basis of certain technical solutions leading to controlled thermonuclear fusion, of developing plasma techniques for particle acceleration, and of designing superhigh-frequency oscillators. New technologies for the electrochemical refining of heavy nonferrous metals (lead, bismuth, and silver) have been developed by utilizing a phenomenon discovered by our chemists, the electrolytic transport of metal from the cathode to the anode during the electrolysis of ionic melts. Having established the phenomenon of a difference of potential in piezoelectric semiconductors, our scientists have been able to design basically new magneto-electroacoustical instruments and devices.

In accordance with the resolutions adopted by 26th CPSU Congress, under the 11th Five-Year Plan the collective of the UkSSR Academy of Sciences is devoting special attention to basic research that determines the prospects of developing the leading branches of the national economy: the fuel and power complex, metallurgy, engineering, and farm production.

The results of basic research in low-temperature physics are being utilized in designing power-industry equipment that permits a significant increase of its capacity and a reduction of its material intensity. On the basis of theoretical research in the earth sciences, effective methods have been developed of prospecting for economic minerals: petroleum, natural gas, iron and manganese ores, and nonferrous metals. Thorough investigation of the physicochemical processes in metals, and of the kinetics of phase transformations, uncovered new ways of obtaining high-grade metals and alloys for various application and methods of processing. Basic research in molecular biology, genetics and biochemistry ensured the development of high-yield varieties of crops, new types of feed for livestock production, "kiyanka" semidwarf winter wheat, dwarf apple trees, fodder crops of the Cruciferae family, and meadow clover. The results of research into the laws of socialist society's economic development have been the basis of a number of recommendations for perfecting the economic mechanism.

However, research alone is not enough to ensure the prerequisites for profound qualitative changes in production. It is also necessary to strive to ensure that research results find their continuation in the development of practical applications directed toward the solution of specific technical and economic tasks. Whereas in the past it was considered normal that research ended in

recommendations and the scientists did not participate in their realization, today the development and introduction of new equipment, materials and technologies in the various branches of the economy have become the indicator of the effectiveness and significance of scientific effort. An important characteristic of the practical applications being developed in our Academy is their predominantly multisectoral significance.

When we speak of technology, we have in mind the entire complex of producing a given product. The special attention that our Academy is devoting to technology stems from a thorough understanding of the fact that faster development of the economy's leading branches cannot be ensured without modern technology and production processes based on it. The Presidium of the Academy is directing its institutes in the natural and technical sciences to develop basic research and to use its results to develop new technologies. Here we believe that it is not obligatory to develop new technologies only on the basis of the research performed at the UkSSR Academy of Sciences. Important results and discoveries in basic research usually become public property, and it is possible and necessary to utilize them in developing basically new technologies.

Our organizational measures to develop work on the projects of the technological plan are supported by appropriate provisions for financing and for material and technical supply. We are striving to implement a policy of financing that not only ensures basic research but is also maximally conducive to the development of new technologies. Redistributing within optimal limits the budgetary allocations for science, we are also attracting funds from the interested ministries and other central agencies. This significantly accelerates the process of developing and--most importantly--introducing the latest technologies. We are strictly adhering to the rule that material resources should go to those who really need them and will be able to achieve significant results.

The creative activity of our institutions and the mobilizing role of their party organizations have lead to certain successes in the matter of developing progressive technologies. During the past five years alone, we presented the economy with more than 300 new technologies of various levels, and they are being employed successfully by enterprises in many branches of industry. This has permitted a noticeable rise in the level of production's mechanization and automation, in the quality and reliability of the products, a reduction of their material intensity, and an improvement of the working and environmental conditions.

Electroslag technology, for example, has achieved world recognition and has led to the development of other technologies: electroslag remelting, casting, surfacing, and welding. It has also been the basis of a new industry: special electrometallurgy. Research in high-pressure physics at the USSR Academy of Sciences uncovered wide possibilities for obtaining new materials with a unique combination of properties, and for studying many important processes and phenomena in the solid state. On the basis of these results, the scientists of our republic developed an industrial technology for synthesizing diamonds and cubic boron nitride. Today the output of diamonds in our country is more than double the same indicator in the United States.

Joint efforts by the institutes of the UkSSR Academy of Sciences and organizations of a number of ministries and other central agencies led to the development of technologies for obtaining highly ductile and high-melting metals:

molybdenum, chromium, beryllium and a series of refractory alloys, superhard materials with high technical parameters.

Very promising is also the new technology of obtaining aerosols that are used in the production of an entire complex of industrial products: new adhesive compositions for printing, highly effective extinguishing powders, coatings for synthetic leather, polyester varnishes, polishing compounds for optical and electronic devices, vehicles for biologically active compounds, and polymer fillers. A basic prerequisite for the development of this and certain other technologies was the investigation of the laws of the disperse phase of matter and the development of various dispersion systems.

Scientists are developing not only technologies that apply to production processes in the traditional sense of this word, but also technologies that apply to man's intellectual activity. In particular, a basically new type of technology for supplying the latest electronic computers with software, based on the theory of digital automata and algorithms, has replaced the human programmer with an industrial process for developing classes of programs.

The activity of the UkSSR Academy of Sciences in developing new technologies in 1979 received recognition in the decree of the CPSU Central Committee.

The second aspect of the conversion of science into a direct productive force --the acceleration in every possible way of the practical application of the advances in science--is especially evident today, under developed socialism.

What is the UkSSR Academy of Sciences contributing toward the solution of these problems? Our scientific institutions are striving to achieve that most results in basic research immediately become inputs into applied research and experimental design that the economy needs now and will need also in the future.

As an effective instrument for shortening the science-production cycle we regard self-financing experimental production subdivisions within the composition of the scientific-research institutions. We are firmly convinced that only with the help of such subdivisions is it possible to develop basic research to the necessary extent, and to ensure a high degree of readiness of the scientific projects for transfer to industrial enterprises. At the end of 1980 the Academy's experimental production base numbered 68 organizations, including 8 plants, 28 pilot plants, 26 design and technological design bureaus, and 6 computer centers. They not only provide the conditions for basic research at the institutes, but they also participate in the development and introduction of new types of equipment, instruments and installations.

The time required for the practical application of scientific results is shortened considerably by the fact that an institute-designing bureau-pilot plant-experimental plant complex is functioning at a number of the leading institutes of the UkSSR Academy of Sciences. For example, through the efforts of the Institute of Electric Welding, its designing bureau, pilot plant and experimental plant, and in cooperation with organizations of the Ministry of Construction of Petroleum and Gas Industry Enterprises, a basically new technology and special-purpose equipment for the butt-welding of large pipes were developed in only 2.5 years, resulting in a four- to fivefold increase of the welders' labor productivity. The Sever-1 welding rigs are now operating successfully under the difficult climatic conditions in the northern part of Tyumen Oblast.

The tasks of the economy's intensive development urgently demand forms of contact between science and production that can shorten the time for the practical application of innovations in the economy.

The Academy has gained considerable experience in cooperation between scientific and production collectives. Its institutes are participating in scientific-research programs approved, respectively, by the USSR State Committee for Science and Technology and by Gosplan UkSSR. As a mandatory element, these programs contain a specified period of introduction, thanks to which the programs have become an effective instrument for accelerating the practical application of the latest advances in science and technology.

Jointly with the research organizations of the individual branches and with industrial enterprises, the scientific institutions of the Academy are fulfilling 94 scientific-research programs and 10 scientific-research and experimental-design plans. The leaders in solving scientific and technological problems on a national scale are the Institute of Electric Welding, Institute for the Problems of Casting, Institute of Cybernetics, Institute for the Problems of Material Sciences, and Institute of Superhard Materials.

An example of successfully fulfilling the tasks of the science-and-technology programs is the technology and equipment for the forming and sintering of intricate parts by the methods of static and hot dynamic pressing and die-forging by means of an explosive charge, developed jointly with enterprises of the USSR Ministry of Ferrous Metallurgy.

Considerable progress has been achieved in solving the intersectoral problem of developing new welding technologies that increase labor productivity 1.5- to 2-fold.

A completely automated line for portioning, charging and melting pig iron in induction-heated crucible furnaces with programmed control, developed through the joint efforts of scientists and production workers, is already included in the plans of shops that are under construction at a number of enterprises.

In addition to the aforementioned programs, there are also other forms of contact that our Academy established between science and production in order to shorten the time between the birth of an idea and its practical application, and these forms have proven suitable in practice.

First of all there is the organization of joint work by the Academy and individual ministries, on the basis of a comprehensive plan of scientific research and practical application. After careful study of a problem that has arisen in a branch, the mutual capabilities are clarified, and a plan is drafted for joint work by the corresponding ministry and the Academy. The plan not only outlines the scientific elaborations, but it also contains provisions to ensure in production the conditions necessary for practical application: the corresponding capacities, material and technical supply, personnel, and a study of the customers' demand. At present such plans for joint scientific-research and planning-and-design work have been adopted and are being successfully implemented with the USSR and UkSSR ministries of chemical and petroleum machine building, of the chemical industry, of the aviation industry, of the petroleum refining and petrochemical industry, and with the UkSSR ministries of ferrous metallurgy, geology, health, food industry, etc.

After the 25th CPSU Congress, on the initiative of the UkSSR Academy of Sciences and the Moscow Automobile Plant imeni I. A. Likhachev, there developed such a form of organizing scientific research and practical application as the comprehensive programs of scientific-research and socioeconomic work by institutes of the UkSSR Academy of Sciences and large enterprises and production associations. Our partners included the Artemugol' [Artemovsk Coal Mining] Association, the L'vov Kineskop [Picture Tube] Production Association, the Krivoy Rog Mining and Ore Concentration Combine, and others.

With the ZIL [Moscow Automobile Plant imeni Likhachev] Production Association, for example, we are solving scientific and technical problems whose ultimate objective is the development of a no-scrap or low-scrap technology in machine building. Thus, the Institute of Electric Welding has already built an automatic system for controlling the process of welding automobile cabs. The Institute for the Problems of Casting has submitted a shorter schedule for the ferritizing annealing of high-strength cast iron. The jib boring tools made of hexanite-R, a superhard material, and the technology of boronating engraved dies, both elaborated by the Institute for the Problems of Material Sciences, have been successfully tested and introduced.

The efforts to perfect production technology at the Moscow Automobile Plant imeni Likhachev, by accelerating the practical application of the latest advances in science and technology, were rewarded in 1981 with the USSR State Premium in the Field of Science and Technology.

At the Kineskop Production Association the design of color picture tubes has been modernized, new heat-treatment schedules have been proposed for the black-and-white and the color picture tubes, and a quality-control subsystem has been installed...Of great economic importance is the research into the cyclic flow-line technology of working the underground iron-ore mines of the Krivoy Rog basin. The results have already been adopted by other branches of the mining industry: the gold mines of Uzbekistan, the asbestos mines in the Urals and elsewhere.

In cases when a technical problem has to be solved in some branch and the own scientific-research institutes of the branch lack the necessary background, branch laboratories are organized with the participation of the UkSSR Academy of Sciences. The ministries concerned finance such laboratories, but institutes of the Academy provide scientific and methodological guidance. Shortening the time required for the introduction of innovations, these laboratories are expanding the range of basic research, in directions essential to the economy.

The first branch laboratory was organized within our Academy in 1970, attached to the UkSSR Academy of Sciences Institute of Physics. At present there are 44 special research laboratories attached to institutions of the UkSSR Academy of Sciences and funded by 24 USSR and republic ministries. In 1980 they completed 90 research topics, 70 of which have been introduced and produced a combined total economic return of more than 32 million rubles.

Practice has confirmed the expediency and effectiveness of this form of cooperation between scientists and production workers. Thus the branch laboratory of the Donets Institute of Applied Physics introduced technological processes of the tool's thermomechanical pretreatment, using hydroextrusion. The laboratory attached to the Institute of the Physics of Metals developed and introduced, at enterprises of the Ministry of the Radio Industry, films with special

properties. The Laboratory for Optoelectronics, formed on the basis of the Institute of Semiconductors and the Tochelektropribor [Precision Electrical Instruments] Production Association (Kiev), transferred to series production electrical instruments that have no moving parts but have optoelectronic reading devices.

As an effective means of accelerating the practical application of completed scientific research, our Academy extensively employs also contracts with individual enterprises. At present there are over 1300 contracts in force between Academy institutions and enterprises. An illustrative example of such cooperation is the joint project of the Institute for the Problems of Casting and the Kiev Motorcycle Plant to introduce the technology of casting crankshafts. Thanks to cooperation with the scientists of the Institute of Superhard Materials, one-half of all the plants and factories in Kiev have changed over to new sophisticated materials for tools.

The large volume of economic contracts concluded by the Academy is helping to speed up the completion of many research projects. We are striving to keep the contracts large and closely related to the basic research being done at the institutes. Each year the Academy fulfills over 3000 contracts. However, an excessive volume of such work poses the danger that the Academy's scientific institutions might become similar to the branch organizations, and therefore we are striving to maintain optimal proportions.

The activity of the UkSSR Academy of Sciences in raising the effectiveness of scientific research and in speeding up the practical application of research results was approved in 1976 by the CPSU Central Committee and received high praise from L. I. Brezhnev in 1977, at a meeting with the heads of the socialist countries' academies of sciences.

The successes of the scientists of our Academy in scientific research and in strengthening their ties with production have been enhanced considerably by the close attention that the Ukrainian Party Central Committee and its Politburo have been constantly devoting to the development of science.

The oblast party organizations are very active and are showing considerable initiative in matters pertaining to the practical application of the advances in science. This has helped to a considerable extent in establishing and developing the regional forms of contact between science and production in the republic. Since 1971, when the decision was adopted to establish regional scientific centers of the UkSSR Academy of Sciences, the party organs have been giving them their constant support.

An important milestone in the activity of these centers was the conclusion of contracts for scientific and technical cooperation between the UkSSR Academy of Sciences and the enterprises and organizations of the republic's regions. Such contracts were concluded at conferences of party and economic activists that were held at the end of the 10th Five-Year Plan at all regional centers of UkSSR Academy of Sciences. The contracts cover all 25 oblasts of the Ukraine.

Comprehensive plans of scientific-technical and socioeconomic work by the UkSSR Academy of Sciences and the enterprises and organizations of the regions have become the organizational form for the realization of the mentioned contracts

under the 11th Five-Year Plan. The tasks of the regional programs are included in the comprehensive plans as their basic components. The number of such programs per scientific center is not large, and they are directed toward solving the problems of those sectors of the economy whose development is the most typical for the given region. Thus each comprehensive plan reflects the specific socioeconomic conditions that have developed in the given region. In close cooperation with the oblast party committees, the scientific centers of the UkSSR Academy of Sciences have performed considerable organizational work to uncover the most important regional problems of accelerating progress in science and technology, and to mobilize the scientific potential of the entire UkSSR Academy of Sciences for their solution.

Within the framework of the comprehensive plans, the scientific potential of the Academy is utilized extensively for the solution of the scientific-technical and socioeconomic problems in behalf of those regions whose scientific potential is small. As an example we can cite Voroshilovgrad Oblast where a large production potential is concentrated, and where transport machine-building and the coal industry are well developed, but where there is only one institution of the UkSSR Academy of Sciences: the Voroshilovgrad branch of the Institute of Industrial Economics. As a result of the organizational efforts of the Donetsk scientific center, on the other hand, 22 institutions of the UkSSR Academy of Sciences have been attracted to work in behalf of the oblast, including 13 Academy institutes located in Kiev. The situation is similar in Zhitomir, Sumy and a number of other oblasts in the Ukraine.

In all, 68 institutions of the UkSSR Academy of Sciences, 70 higher educational institutions and about 130 branch scientific-research and planning-and-design institutes have been attracted to participate in the fulfillment of the comprehensive plans. They are doing scientific research in behalf of more than 300 industrial enterprises located in all 25 oblasts of the republic and reporting to 45 different ministries and other central agencies of the country.

Fulfillment of the comprehensive plans will ensure the following:

- In machine building, the development of high-strength and corrosion-resistant materials, and on their basis the improvement of the strength, reliability and service life of machinery and equipment, and the reduction of their material intensity.

- In ferrous metallurgy, perfection of the technology of steelmaking and rolling, particularly the development of small-scale technological processes, and improvement of steel quality and of the operation of metallurgical equipment.

- In the coal mining, intensification of working considerable depths (1200 to 1800 m) by reequipping the mines, and the development and wide-scale introduction of a coal-removing technology that does not require the constant presence of miners at the working face.

- In the chemical industry, elaboration of methods for obtaining new materials with the required properties, reduction of the energy intensity of chemical production, and development of technologies for the reprocessing and utilization of wastes.

- In agriculture, further mechanization of farm production and of livestock production in particular, improvement of the level of farming and higher crop yields.

Close traditional ties have been established between the Academy's institutes and the enterprises in the capital of the republic. On the initiative of the Kiev City Party Committee, a number of commissions have been formed that include representatives of Academy institutions and of the city's enterprises, to coordinate the efforts of scientists and production workers. The gorkom organizes science-and-practice conferences at which views are exchanged and specific ways are proposed to accelerate the practical application of the advances in science. For the 11th Five-Year Plan, the long-range work plan of the Kiev City Party Committee and the Academy's Social Sciences Section, to further improve the workers' communist education and for the socioeconomic development of Kiev, has been approved and is being implemented successfully. A natural result of the long-standing and constantly closer cooperation between scientists and production workers was the signing, in June 1980, of a contract of scientific and technical cooperation between the UkSSR Academy of Sciences and the enterprises and organizations of Kiev.

An important role in the fulfillment of the tasks specified in the contracts with the oblasts is played by the Academy's regional scientific centers. They organize and coordinate basic and applied research, in order to accelerate the development of the given regions' economies. For example, the Pridneprovskiy Scientific Center is solving important tasks in the fields of metallurgy, comprehensive utilization of the mining industry's wastes, agriculture, and environmental protection. National economic problems of ferrous metallurgy, coal mining and coal-tar chemical industry, and of environmental protection are being solved by the Donets Scientific Center. It has become the initiator of cooperation contracts between the UkSSR Academy of Sciences and the oblasts in the Donets Basin.

Scientists of the Western Scientific Center are making a very important contribution toward applying the advances in science to the practice of building communism. Here, on the initiative of the L'vov Oblast Party Committee, special-purpose interdepartmental scientific production associations have been formed, in machine building, instrument building, agriculture, and in geology and geography. This makes for closer coordination of the activities of the Academy's institutes and of the enterprises subordinate to various ministries and other central agencies, and it accelerates scientific and technical progress in the region. It has become possible to utilize innovations more extensively at related enterprises of different branches, to pursue a unified technical policy, and to effectively employ a comprehensive system of managing product quality. The experience with cooperation between the center's scientific institutions and the industrial enterprises has gained society's great appreciation, and it has been reviewed and approved at a session of the Presidium of the USSR Academy of Sciences.

Institutions of the Northwestern Scientific Center are successfully solving physics problems, the tasks of developing the electric power industry and power machine building, and of perfecting the processes of metalworking. Scientists of the Southern Scientific Center are helping to solve the problems of reducing manual labor in industry, of developing various branches of the economy, and of utilizing the resources of the Black Sea.

An important form of contact between science and practice, one that speeds up the practical application of innovations, is active participation of the republic's scientists in the realization of large-scale national economic programs of all-union significance: the electric power program, the development of transportation, more economical use of metals, reduction of manual labor, development of the Baykal-Amur Trunk Line zone, expansion of the output of consumer goods and improvement of their quality.

The third aspect of the process of science's conversion into a productive force --the scale on which the advances in science and technology are applied in practice--depends, as already noted earlier, predominantly on the activity of the economy's branches, on how receptive their workers are of things new, on their foresight and ability to find the most effective and scientifically substantiated solutions to the arising problems. The branch ministries are fully aware of the fact that production can be increased, its effectiveness can be raised, the assortment of products can be broadened, and high profitability can be maintained only through continuous technical retooling, by introducing progressive technologies and by applying the advances in science. They are keenly interested in the achievements of the Academy's scientists, and they have established effective relations between their enterprises and the Academy's institutes.

A good example of the fruitfulness of such ties is the experience with cooperation between the UkSSR Academy of Sciences and the USSR Ministry of Nonferrous Metallurgy. The geography of the nonferrous metallurgical plants, where the results of joint efforts are being applied to practice, is very broad. Cooperation between the Institute of Electric Welding and the ministry's enterprises has become a tradition of long standing. The Usol'ye Mining Equipment Plant in Irkutsk Oblast, for example, is using in electrolytic baths the bimetallic steel-aluminum bolts made by the method that scientists of this institute had developed. Technologies developed at the Institute of General and Inorganic Chemistry are being used in the production of bismuth at the Dal'polimetall Association, and in the refining of lead at the Ordzhonikidze Elektrotsink Plant and elsewhere. A computerized system for the planning and operational management of mine haulage, developed at the UkSSR Academy of Sciences Institute of Cybernetics, has been installed at the Almalyk Mining and Concentration Combine.

A joint session of the UkSSR Academy of Sciences Presidium and the Collegium of the USSR Ministry of Nonferrous Metallurgy approved a comprehensive joint work plan of scientific research and experimental design under the 11th Five-Year Plan, covering a variety of problems related to the development of this branch. A visit to our Academy by the USSR ministers of nonferrous metallurgy, chemical industry, electronics industry, machine tool and tool building industry, electrical equipment industry, and communications equipment industry was of great importance from the viewpoint of strengthening our ties with the various branches of the economy.

On its part the Academy of Sciences submitted in 1980 a total of 136 technological elaborations to 64 ministries and other central agencies of the country. Of considerable interest to the branches of the economy are the elaborations resulting in the reduced consumption or complete replacement of tungsten-containing tool steels, the technologies for the production of rolled multi-layer pressure vessels, the production of ferrous and nonferrous powders by spraying the melts, etc.

The country's ministries and other central agencies are already introducing many of these elaborations at their enterprises. For example, the Ministry of the Petroleum Industry is successfully using a technology developed by the Institute of Electric Welding for the explosive cutting of damaged pipelines, without having to remove the petroleum from them. Organizations of the Ministry of Installation and Special Construction Work are using welding wire made of powder to weld structures. The technology of surfacing the parts of farm machinery, recommended by the scientists, has proven suitable in practice within the Soyuzsel'khoztekhnika system.

The republic's oblast party organizations are doing considerable work to expand the scale of the practical application of the advances in science and technology. The economic party aktivs that were held in Donetsk, Dnepropetrovsk, Khar'kov, L'vov and Odessa played an important role in this. Representatives from the other oblasts of the Ukraine also attended these aktivs. The economic party aktivs have made the work of the scientists and production workers more purposeful in the more important directions of the progress in science and technology.

One of the most recent examples of joint work by party organizations and scientific institutions in studying the experience with the integration of science and production has been the All-Union Seminar held in L'vov in 1981, on the initiative of the USSR Academy of Sciences, the UkSSR Academy of Sciences, its Western Scientific Center, and the L'vov Oblast Party Committee. The seminar was attended by prominent Soviet scientists, enterprise directors, the heads of state and social organizations, enterprise workers, and staff members of higher educational institutions. Realization of the seminar's recommendations will unquestionably help to upgrade the management of the progress in science and technology. (The proceedings of this seminar have been published in VESTNIK AKADEMII NAUK SSSR, No 8, 1981, pp 35-62.)

The scientific-technical integration of the Soviet Union with the CEMA countries is becoming an increasingly important condition for raising the effectiveness of science. A substantial economic return can be obtained, and is already being obtained, from such directions of this integration as the intensive exchange of scientific and technological information, the exchange of economy-organizing experience, the joint elaboration of production technologies, etc. The UkSSR Academy of Sciences is devoting special attention to the timely fulfillment of the Soviet obligations stemming from the multilateral scientific-technical programs of the CEMA countries and of their academies of sciences, and from the bilateral plans of scientific cooperation with these countries. At present the institutes of the UkSSR Academy of Sciences are working with their counterparts in the fraternal countries on 212 research topics. The results of these research efforts have been, in particular, the development of highly productive new equipment and apparatuses, structural materials, and sophisticated technological processes. Our institutes are functioning successfully as CEMA international coordination centers for the "Powder Metallurgy" and "Welding" problems.

Ukrainian scientists are participating in the work of many international scientific organizations, pooling their efforts with those of the scientists of all continents to solve the great problems of our time, particularly the preservation of peace. Scientists of the UkSSR Academy of Sciences, together with all Soviet scientists and their colleagues in the fraternal socialist countries,

are raising their voice in protest against the arms race and the threat of nuclear war, and in support of the policy of detente and peace.

Under developed socialism, the conversion of science into a direct productive force leads to structural changes in the economy, to changes in the education, skills and specialization of production workers, and to the spiritual enrichment of the workers. In conjunction with this there arise a series of complex technical-economic, sociopolitical and intellectual problems of society's development. In solving these problems the CPSU always relies on the firm foundation of analyzing the existing reality and its prospects. Here the scientific basis is provided by the investigations of the social scientists who are helping to solve the problems of ideological, political-educational and economic practice.

Science in our time truly encompasses all aspects of society's life and becomes a powerful lever of technical and social progress. It is a very important economic and political task to make science more effective and to utilize more completely and more quickly the advances in science and technology, for the economy's uplift and for satisfying the constantly increasing needs of socialist society. The key to the solution of this task is the further perfection of the management of scientific research, of the diverse forms and methods of research activity.

As L. I. Brezhnev noted at the 26th CPSU Congress, the party supports "improving the organization of the entire system of scientific research" ("Materialy XXVI s"yezda KPSS" [Proceedings of the 26th CPSU Congress], Moscow, 1981, p 42). The UkSSR Academy of Sciences is devoting considerable attention to selecting the principal directions of scientific inquiry, to raising the level and improving the quality of planning. Special emphasis is placed on utilizing more fully the target program method, on the wide participation of the Academy's scientists in the elaboration of programs that are of union significance. Ways of improving the experimental production base of the Academy's institutions, the financing and the material-technical supply of research and of elaborations are examined in detail.

Solution of these problems requires continued selfless work by our scientists. Their high sense of party responsibility to society, their creative and political maturity in carrying out what the Communist Party outlines, are a reliable guaranty of the present and future successes of Soviet science.

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IMPACT OF COMPUTERS ON SOCIOECONOMIC MANAGEMENT DISCUSSED

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[Posthumous article by Academician V. M. Glushkov, vice president of the UkSSR Academy of Sciences and director of its Institute of Cybernetics: "Problems of Socioeconomic Management in the Age of the Revolution in Science and Technology"]

[Text] Viktor Mikhaylovich Glushkov (1923-1982) was an eminent Soviet scientist and science administrator, an outstanding specialist in the field of computer technology and automated management systems. He was vice president of the UkSSR Academy of Sciences, and the founder and permanent director of its Institute of Cybernetics.

One of the principal changes in today's world is taking place in the information management sphere of the economy, not only in the industrially developed countries but in developing countries as well. The essence of this change is the formation of all-embracing man-computer (interactive) systems of management, on a national and international scale. It should be emphasized that we are discussing not the simple use of electric computers for the automation of complex computations, but the creation of a basically new technology for the processes of organizational management.

Economic development, in distinction from simple growth, involves the differentiation of the structure and relations of the economy's system, the complication of production as a result of its specialization, diversification and spatial ramification. But all this generates and intensifies flows of management information that determine the level of the functioning of the entire system as a whole, as well as of its individual elements. The task is to manage these rapidly growing flows of information (as a result of the system's development). In other words, the point in question is the information-controlling (managing) system's ability to "cope" with the growing information, i.e., to maintain the developing (branching, increasingly more complex) object in a unified, purposeful course of functioning. This is the more important under socialism where the economy develops "primarily" under unified central management and is unable to develop in any other way (here the elements of anarchy are ruled out in principle).

In order to advance, society must attain ever newer levels of integration, and this is ensured by the technological "capability" of the managing system. The

rise to a higher level of integration inevitably involves the growth and greater complexity of the planning and economic, accounting and statistical reporting, analytical and organizational tasks at every level of state administration in general, but this applies particularly to the lower levels of management: to the enterprise, association and territorial levels. All this necessitates processing and transfers within the structures of managing huge (and rapidly growing) flows of planning and economic, scientific and technical, social and other information. Unless such processing and transfers are ensured, the economy could fall into a state of "disorganized complexity."

Here the principles of management, the social mechanisms of organizational processes, are in themselves inadequate. The principles and social mechanisms of management must be realized technologically, which requires a system of information processing that is adequate in terms of capacity for the attained scale and complexity of the economy. V. I. Lenin set the task of converting "the entire state economic mechanism into a single large machine, an economic organism, one that will function in a way such that hundreds and millions of people will be guided by a single plan."¹ Plan-conforming development, according to Lenin, is development "based on exact consideration of masses of data, when a single center controls the successive stages in the processing of a raw material, up to obtaining an entire series of various finished products; when these products are distributed among tens and hundreds of millions of consumers, on the basis of a single plan"² These basic tenets of Lenin (just as his principles of administration in general) are as valid today as they were a half century ago. But the means, methods and instruments of their implementation at the present levels and complexity of the economy cannot be the same as in the 1930's (when, for example, it was sufficient to have one people's commissariat of heavy industry).

Already in the mid-1970's, 200 billion data a year were circulating in the system of managing Soviet industry.³ Under each of the past three five-year plans, the flow of information within the USSR Central Statistical Administration increased by 40 to 50 percent; by the end of a five-year period, the information load per average worker increased 1.5-fold over the start of that period. There now are over 500 billion economic transactions (documents) a year in the country.⁴ The volume of planning and management information circulating in social production is estimated at $2 \cdot 10^{13}$ bytes a year.⁵ About 60 billion written planning and management documents are generated in the country each year (assuming that the average document is a manuscript of 10 pages, with 1800 characters per page; i.e., this estimate is a fairly rough one). According to the available forecasts, this figure could double or triple by 1990. A complete set of all --both large and small--documents circulating in the country would be equal in volume to 25 million books of 500 pages each.⁶ According to rough estimates, the planned management of the country's economy (the processing of the entire volume of economic information) involved 10^{16} mathematical operations a year in the 1960's, which would have required 10 billion persons (a figure 100 times higher than the total number of persons gainfully employed in the economy). And now these figures are much higher.

Conservation of the traditional technology of processing planning and management information leads to the growing "disorganized complexity" of the economy and raises information-organizational barriers to its plan-conforming growth. The quality of management is beginning to deteriorate, an ever greater proportion of the planning information becomes stale, and the "dead time" between

communication and feedback is increasing. As a result, losses are increasing and the rates of economic development are declining.

The issue, of course, is not only the technology of organizational management. A major role (or the primary role, if you wish) is played here by the economic mechanism (the set of economic instruments that ensure the "self-adjustment" of the economy's individual elements to the desired target mode of its operation). We have in mind the system of plan indicators, prices, wages, credits, norms, etc. which, when properly constructed, ensure the indicative influence of the system of state planning and management upon the dynamics of the economy. However--and this should be emphasized--the economic mechanisms "do not function" by themselves, isolated from the system of organizational management (especially not under the conditions of socialism). No system of plan indicators, prices and criteria for evaluating the performances of collectives and individual workers can function successfully without the simultaneous creation of a developed (adequate) accounting and control (information) system that covers all levels and links of the national economy as a unified complex.

The management (information and control) system adapts to the new requirements of the developing object (the economy) in various ways: through quantitative growth (an increase in the number of persons employed in the sphere of planning, control and organization) and expansion of the number of managing organs and their links (central agencies, main administrations, departments, offices, etc.); through a division of labor among the managerial personnel, their specialization, better discipline, intensification of their labor, and their ideological education; by perfecting the hierarchical structures of the managing organs and fine-tuning their functions; through the mechanization of office work; by improving the traditional means of communication (postal service, telephone and telegraph), etc. There are many ways and means, and all of them are employed. And parallel with this it is also possible to perfect the socioeconomic mechanisms. The directions of such perfection are outlined in the 1979 decree of the CPSU Central Committee and the USSR Council of Ministers entitled "Concerning the Improvement of Planning and the Strengthening of the Economic Mechanism's Influence on the Effectiveness of Production and the Quality of Work."

However, all this has certain limits that are determined by the technology of the work of planning and management. At one time these technological limits were very remote, and nobody paid any attention to them. Until the appearance of cybernetic technology, moreover, the question did not even arise of an alternative to the "paper" (outdated manual) technology of data processing. But the present revolution in science and technology, with its flood of information in all areas of social practice, has brought these limits much closer (and on the other hand it has also provided an opportunity to radically overcome them).

In the age of the revolution in science and technology a period has begun when a qualitative improvement in the management of the economy, and of technological progress in particular, is no longer possible through a further increase in the number of persons employed in the system of management, and by perfecting the organizational and socioeconomic mechanisms in the stream of the traditional technology of information processing. An important feature of the revolution in science and technology is that a "nervous system" of production is created that is external in relation to the worker, and the technology of organizational management (the information-managing component of labor activity) is transferred

to a mechanical basis; just as at one time a "skeletal and muscular" production system was created that was external in relation to the worker, and the technology of physical labor was transferred to a mechanical basis.

The exceptional importance of the problems associated with a changeover to man-machine technology in planning and management activity stems from the basic content of the revolution in science and technology; or more accurately, from a proper understanding of the revolutionary changes now taking place in the productive forces of society. We must dwell on this in somewhat greater detail, because the question here is to choose the principal direction of the efforts to realize one of the requirements contained in the Communist Party's program: to combine the achievements of the present revolution in science and technology, with the advantages of socialism.

When people mention the revolution in science and technology, they usually focus their attention on such of its features as the acceleration of the rate of progress in science and technology, the conversion of science into a direct productive force, etc. These features of the revolution in science and technology unquestionably are important. In our opinion, however, they do not define that main qualitative leap which is associated first of all with the concept of revolution itself. After all, the accelerated rates of progress in science and technology will be preserved (and will even accelerate further) also in the future. Having been converted into a direct productive force, science will hardly lose this characteristic (at least not in the foreseeable future). But from the fact that these two characteristics are preserved it does not follow at all that from now on we will be living under the conditions of a revolution in science and technology. By definition, any revolution presupposes some qualitative changes confined to a relatively short time interval, and it cannot continue permanently.

Consequently, the main characteristic of the revolution in science and technology must be sought in something else. In our opinion, this "something else" is the management of the progress in science and technology. From our point of view, the essence of the revolution in science and technology lies in that the quantitative changes in material production, and in science and technology, gradually accumulate until they exceed a certain limit beyond which it becomes necessary to radically change the methods of managing the progress in science and technology. Once the methods of management have been adapted to the new conditions, the next period of evolutionary growth starts, a period of a gradual accumulation of quantitative changes, until the need again arises of a new revolution in the methods of managing the progress in science and technology.

What quantitative changes in material production, in the development of science and technology, sparked the present revolution in science and technology? Such changes were first of all the continuous growth of the complexity of the products produced by industry, and the growing complexity of production technology in every branch of the economy. At the same time, the rates of production's technical reequipment have not declined; to the contrary, they are continuing to rise. Society is confronted with the task of making ever more complex changes in production, within less and less time. Up to a point, this task could be solved adequately by mobilizing the reserves of a quantitative nature that existed in the traditional consecutive method of managing the progress in science and technology.

What is the essence of this method? It is first of all the purely branch organization of managing the progress in science and technology: every branch

plans to perfect its own production and technology, taking into consideration the scientific and technological level that the other branches have already achieved, rather than the level they are planning to attain. In the course of this (as has often been the case in many branches of our economy) designers are under the obligation to use in their designs only those new materials and supplied parts that already are being produced by Soviet industry. Under this method of management, interrelated elaborations even in contiguous spheres follow consecutively one after the other: until the full cycle of a new material's development and production is completed, the elaboration of new designs in which the new material is used will not begin. Under the complex intersectoral ties that exist today, this delays immensely the development and introduction of new products and technologies.

Under the purely consecutive method of managing the realization of even a single innovation in one branch, the individual stages of work follow in strict sequence: research, experimental design, experimental production, preparations for full-scale introduction (plant construction and reconstruction), and finally the full-scale utilization of the innovation. Moreover, very often the planning of each successive stage begins only after the completion of the preceding stage, and thus to the realization time of each stage it is necessary to add also the time required for its planning.

Understandably, the consecutive method of managing progress in science and technology is the least demanding in terms of organization and requires minimum effort of the managing apparatus. Primarily this explains its vitality. Moreover, the consecutive method gives fairly satisfactory results in the case of relatively small and simple improvements. But for large innovations (such as the development of the nuclear or space-rocket industry) the consecutive method of management has proved entirely unsuitable. Had the designers of the first nuclear reactor been forced to use only the materials then available from Soviet industry and the process of developing the necessary materials (and many other things) had not been managed actively, and had designing started only after the completion of basic research, we today would hardly have nuclear weapons or even nuclear power plants.

The need to manage complex processes of this kind produced new, target-program methods of managing the progress in science and technology, methods that permit to the maximum possible extent the parallel completion of all the stages that constitute the realization of large innovations. Although actually such a parallel method of management is necessary only in the case of innovations of sufficiently large scale, its application is unquestionably advantageous even for innovations of smaller scale. Therefore it is natural to regard the process of changing over everywhere in the world from the consecutive to the parallel method of management as one of the most important characteristics of the present revolution in science and technology. L. I. Brezhnev in his report at the October 1980 Plenum of the CPSU Central Committee, and the resolutions adopted by the 26th CPSU Congress emphasized that changeover to the target-program method of managing the progress in science and technology was one of the most important tasks in perfecting management.

It should be pointed out that the task of changing over everywhere from the consecutive to the parallel method of management basically differs from using the parallel method on a few of the most important innovations, which has already

been realized in practice. The point is that a changeover to this new method of management, with the maximum possible number of all processes running in parallel, would increase the volume of managerial work a hundred or even a thousand times. So long as this changeover is made on only a small number of projects, the necessary quality of management can be ensured by attracting to the already existing or new managing apparatuses the number of people necessary to solve the new tasks arising here. But the country's entire population would not be enough in the case of a general changeover to the new methods of management if only the traditional technology of management (people, paper, the mail, telephone, etc.) were used to solve all the necessary tasks. Therefore a radical change is necessary in the present technology of organizational management, and not only in scientific research and development but in the management of the entire economy where, in the final outcome, the advances in science and technology are realized.

What is this new technology of management like? Its basis is a network of computer centers at the various levels (ranging from the enterprises to Gosplan and the Council of Ministers) linked together by automatic communications lines, and of so-called terminals that actually are automated desks for the administrative and managerial workers at all levels. In the memory of the electronic computers constituting the system there is stored a constantly updated information base that exhaustively describes all levels of the economy, and also a system of programs with which it is possible to solve practically all (or, in any case, most) tasks of socioeconomic management.

Usually (in social management in particular) these tasks are performed in the conversational mode, i.e., in interaction between people (the administrative-managerial apparatus and managers at every level) and the technical part of the system. In the course of this, the flows of paperwork (with the exception of informal letters containing various proposals, complaints, etc.) are eliminated. All types of formalized interaction between the various units of the administrative and managerial personnel are locked into the system. Within the scope of his authorization, however, any official of the administrative and managerial apparatus is able to request from the system any document (report, plan, order, etc.) in its usual form (hard copy).

The first ideas concerning the new technology of organizational management surfaced in our country at the very beginning of the 1960's. In July 1964, under the guidance of the author of this article, the first plan was elaborated of a State Network of Computer Centers, with proposals for the solution of many of the problems in conjunction with the new technology of organizational management that subsequently was called the State Automated System of Information Acquisition and Processing for the Needs of Accounting, Planning and Administration (OGAS).⁷

The task of creating OGAS was first formulated as an important state program in the directives of the 24th CPSU Congress. Implementation of this program began under the 9th and 10th Five-Year Plans. It should be emphasized that in the resolutions of the 24th and 25th CPSU Congresses, OGAS is envisaged as a system of mutually cooperating computer centers. The resolutions of the 26th CPSU Congress call for continuing the integration of the networks of automatic control systems and shared computer centers into OGAS. But the notion of OGAS as the simple sum of such centers still persists. Often this misconception is aggravated by the fact that computer centers are built and then attempts are made

to solve in them the tasks of planning and management by the old technology. It should be clearly understood that the simple use of electronic computers in this sphere, without developing a basically new technology of organizational management, can produce some improvement, but it is unable to realize even one-tenth of the enormous potential inherent in the management revolution now taking place.

Creation of a new technology of organizational management is a very complex process that requires considerable organizational and material efforts. A desire to avoid the difficulties involved often raises the question as to whether it would be possible to forgo the development of an automated technology of organizational management by simply streamlining the organizational structures and perfecting the socioeconomic mechanisms.

The experience with building socialism demonstrates that there are a certain logic and method for solving the problems that are ripe for solution, and foremost among these are the economic and social problems. They are decisive and goal-orienting for the other problems, including the ones related to OGAS. In the given case we must rank first among the economic problems the perfection of the economic mechanism and of the economy's organizational structures. Perfection of the socioeconomic mechanisms unquestionably plays the primary role with respect to the technological reconstruction of management. The well-known shortcomings in the use of electronic computers appear to stem from the fact that often computers are installed in an organizational and economic "environment" that has not been made ready for them.

At the same time, however, the economic mechanisms must not be fetishized. Although this may sound paradoxical, the fact nevertheless remains that even among management specialists there persists naive faith in the unlimited capabilities of such mechanism; anything that cannot be accomplished by direct methods (of planning, accounting, control, etc.), they believe, can be achieved by introducing some miraculous economic mechanism. The possibilities based on economic, and especially socioeconomic, mechanisms are indeed enormous. Enormous, but not unlimited. Those who think otherwise forget that the socioeconomic mechanisms do not function by themselves; instead, they are interpreted and activated by people in the final outcome, although not necessarily by the ones who formally belong to the administrative and managerial apparatus.

Perfection of the organizational structures, economic mechanisms, and of the technology of management obviously are not identical tasks. In the age of the revolution in science and technology, however, they are closely interrelated. Moreover, the solution of the first task is an integral part of creating a new technology of organizational management. This fact was taken into consideration also earlier in the practice of building socialism. It is a known fact, for example, that in the late 1920's and early 1930's, in conjunction with the country's unfolding industrialization, the party carried out an economic management maneuver that included a change of the economic mechanism as well as the formation of management methods and of the managing apparatus. Important levers of economic management were introduced in that period under the conditions of forced industrialization: the principles of planning, profit and loss accounting, and pricing, the system of financing and providing credit, the system of work organization, and the wage system. At the same time, also the problems of organizational management were being solved: hierarchical management

structures were formed, their functions were refined, departmentalism was replaced by the principle of one-man management and responsibility, the structure of the people's commissariats was formed, new standards were introduced, accounting and statistical reporting procedures were tightened, and the corresponding documents were listed. In other words, the streamlining of the technology of information processing, and of organizational management proceeded simultaneously.

All this jointly gave the state a powerful economic-management "motor" that has played an immense role in the construction of socialism and basically is functioning even today. And now the tasks have arisen of qualitatively further perfecting the economic mechanism as well as the system of organizational management, with due consideration for the new boundaries of the economy.

Under the present revolution in science and technology, the significance of changing technologically the organizational processes in order to perfect the economic mechanism and the system of social administration has increased qualitatively (specifically as a result of the appearance of computerized information technology). By itself, divorced from the new automated technology of management, solution of the task of improving the economic mechanism is unable to create management systems that could fully meet the requirements of the revolution in science and technology.

For a better understanding of the situation, attention must be devoted first of all to the existence of objectively necessary tasks of organizational management. We include among them the problems of managing the flows of materials, from raw material to final demand, and of managing the progress in science and technology, from a set of ideas to their realization in the economy and the social sphere. Here we have in mind not only the aggregated problems to be solved at the highest levels of management, but also (and primarily) the tasks that can be broken down in detail, according to work stations and the persons responsible for carrying them out. It is easy to see that the overall complexity of such tasks is determined primarily not by the manner in which management is organized, but by the complexity of social production's technology and of its technological relations in particular.

Of course, the overall volume of management tasks that actually must be solved can be reduced at the cost of lower operational efficiency: i.e., at the cost of a longer response time to the arising departures, by waiving optimization and even the complete balancing of the plans, etc. But if the volume of management tasks to be solved is reduced below the objectively necessary minimum, noticeable material losses occur in the economy (and these losses become greater as the volume is reduced further).

In practice it is impossible to completely eliminate such losses, not to mention the effects of various incorrectly forecast factors. Complete elimination of losses would involve a catastrophic increase in management's work load, and management would be unable to cope with it even with the help of modern automated technology. Therefore, any realistic formulation of a task should start out from some permissible minimum level of losses, say 1 percent. Moreover, there exists an objectively optimal amount of loss. It is determined by the fact that beyond a certain point the savings resulting from a further reduction of the losses no longer cover the necessary expenses of a corresponding improvement in the quality of management.

The present technology of organizational management was developed for slow rates of progress in science and technology and for a relatively simple technology of social production. Adequate for the objective conditions, it ensured organizational management of current production and its perfection, at a reasonable level of losses. But as the rates of science's development and introduction in the economy increased, the management tasks became constantly more complex, not only in the management of the progress in science and technology, but in the management of current production as well. Progress in science and technology led first of all to a rapid expansion of the list of products; secondly, it made production technology more complex. In addition, the noticeably fast replacement of products and technologies with newer ones left less time for the solution of management tasks. Thus the work load of the system of management increased constantly. Up to a certain point, the self-perfection of the organizational structures and of the socioeconomic mechanisms within the framework of the traditional technology was able to compensate for this increase of the work load.

Within the framework of the old technology, however, even an ideally organized system of management has its quantitative limits. After all, the human brain's capacity to process information is not unlimited. In terms of arithmetical operations (even with the use of a calculator) it is limited to a few hundred thousand operations a year. There are similar limits also to text editing, to solutions of a qualitative nature, etc. Consequently, at a given size of the managing apparatus, its capacity is strictly limited even under ideal organization. Under the conditions of the revolution in science and technology, this capacity is rapidly exhausted. As the undertaken estimates indicate, already in the 1960's even an ideally organized managing apparatus of 200 million persons would have been unable to ensure the necessary quality of management (without increasing the relative volume of losses). In itself, then, perfection of the organizational structures, even with an increase in the size of the administrative and managing apparatus, is unable to cope with the growing volume of objectively necessary management tasks.

As the rate of progress in science and technology accelerates and the technology of social production becomes more complex, the reserves in perfecting both investigated mechanisms sooner or later become exhausted. When this moment arrives (which this author proposed earlier to call the "second information barrier"), further development under the preserved traditional technology of management inevitably leads to a progressive deterioration of the quality of management and, consequently, to a corresponding rise of losses, a slowdown of the economy's rate of development, a decline of the technical level of production, and to other unfavorable phenomena.

The overcoming of the second information barrier makes a new (automated) technology of organizational management a historical necessity. Once this revolutionary leap has been achieved, further perfection of management can be ensured within the framework of the new technology, by continuously increasing the combined total capacity of the electronic computers, and by gradually transferring to them an ever greater proportion of the management tasks.

Why is the considered information barrier called the second one? The point is that in the history of the economy's development there was a period when not only electronic computers, but also all the attributes constituting the present

technology of management--the circulation of documents, organizational structures, economic mechanisms, etc.--were unnecessary for effective management of the economy. We have in mind the primitive communal system when one person per unit was sufficient to manage the separate, noninterrelated units of social production. The primitive level of the productive forces' development and, as a result, of the production relations enabled one person (the leader of the clan, tribe or commune) to cope with all the simple management tasks of that time. The first information barrier marked that level of the productive forces' development at which the capacity of one person's mind was no longer sufficient, and it became necessary to divide the parallel management tasks among a few, and eventually among many persons. In other words, a changeover was made to a basically new technology of management, one that was based on employing hierarchical organizational structures and economic mechanisms, primarily the market mechanism.

In the history of the development of organizational management's modern technology there were of course also other leap-like changes, associated with the discovery of writing, printing, double-entry bookkeeping, the telephone, etc. On the other hand, such innovations as, for example, the calculator had practically no effect on the technology of organizational management. This is something that we again wish to call to the attention of those who assume that in the present stage the automation of organizational management simply means the replacement of calculators with computers. After all the present revolution, not only in the technology of organizational management but also in man's entire information activity, is justifiably compared to the revolutions triggered by the invention of writing and of the printing press.

The immense new possibilities created by a wide-scale changeover to the methods of storing, retrieving and processing information in computer networks have produced a new field of man's scientific and practical activity, called informatics. Specialists estimate that by the early 1990's this new field will surpass all the productive branches (chemical industry, metallurgy, automotive industry, etc.) in terms of personnel and material resources. In many countries (developing as well as developed ones) special ministries have been formed for the central management of this field of activity. Essentially a new branch of the economy is being formed that services the other spheres of activity, the sphere of management in particular. Computer technology constitutes its physical production base, for mechanical (industrial) modes of information processing.

The information-processing industry not only frees management of paperwork, in that routine paper generation can be transferred to the computer; it also provides scientific information for production workers. Large-capacity information retrieval systems ensure the mobilization of the scientific potential and its practical application in production. Moreover, an ever greater proportion of new information is stored in computer memory only. This applies especially to the most promising fields of science and technology. (In nuclear physics, for example, 90 percent of all "gained" information is stored only in computer memory and is not duplicated as traditional hard copy.) In some countries such as France, for example, most of the economic information is concentrated in electronic computers. The Soviet Union plans to introduce on a wide scale the recording of primary information on minicassettes. This will increase the reliability of information storage, reduce its cost and--most importantly--permit the updating of large volumes of information and their better utilization in practice. Eventually the enterprises or individual officials who "drop out"

from the sphere of computerized information services will be cut off from essential data bases.

The present revolution in science and technology is many-sided and complex. But its main content, in our opinion, is the appearance of a basically new, man-machine technology of information processing. Since the circulation of information is the basis of the functioning of any organization, the revolution in science and technology should be viewed primarily as a revolution in organization and management. A leap must be achieved specifically in the technological base of information processing and organizational management. Once this revolutionary leap has been made, management can be further perfected within the framework of the new organizational technology, by continuously increasing the combined total power of the electronic computers and by gradually transferring to them an ever greater proportion of the tasks of organizational management.

FOOTNOTES

1. V. I. Lenin, "Polnoye sobraniye sochineniy" [Complete Works of], Vol 36, p 7.
2. Ibid., Vol 27, p 425.
3. Cf. Ye. G. Yasin, "Ekonomicheskaya informatsiya. Chto eto takoye?" [Economic Information. What Is It?], Moscow, 1976.
4. EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA, No 1, 1980, p 76.
5. D. G. Zhimerin and V. A. Myasnikov, "Avtomatizirovannyye i avtomaticheskiye sistemy upravleniya" [Automated and Automatic Management Systems], Moscow, 1979, p 290.
6. V. A. Myasnikov, "Results and Long-Range Tasks in Automating the Processes of Management in the National Economy," UPRAVLYAYUSHCHIYE SISTEMY I MASHINY, No 1, 1977, pp 3-6.
7. The mentioned plan outlined all the basic elements of OGAS: the technological base (State Network of Computer Centers); distributed data bases and their management (information dispatcher services); a system of solving tasks received from remote terminals; a system for transmitting masses of information "upward," with their aggregation and disaggregation, and a system of "horizontal" interaction (especially important for processing heuristic information). The main thing is that the plan advanced and incorporated the idea of a changeover to a "paperless" interactive system of information processing and organizational management (admittedly in a form that still required detailed specification).

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SURVEY OF SCIENTIFIC AND TECHNICAL PROGRESS IN SOCIALIST SOCIETY

Moscow EKONOMICHESKAYA GAZETA in Russian No 43, Oct 82 pp 1-7

/Material for training course: "Scientific and Technical Progress and the Economy"

/Text/ During the new school year schools of communist labor and others are studying the source "Scientific and Technical Progress and the Economy." The standard program for this course was published in issue No 35 of EKONOMICHESKAYA GAZETA. Below are published materials for the study of the first subject.

During the course of the school year EKONOMICHESKAYA GAZETA will publish training and methodological material for all subjects of this course and also of the course "The USSR Food Program" (the first subject was published in No 42).

"The conditions under which the national economy will develop in the 1980's make it even more urgent to accelerate scientific and technical progress. There is no need to convince anybody of the great significance of science. The party of communists proceed from the idea that the construction of a new society is simply unthinkable without science."

L. I. Brezhnev

From his report at the 26th CPSU Congress.

A Powerful Factor in the Construction of a New Society

V. I. Lenin drew a direct connection between the construction of a socialist and communist society and the victory over capitalism in the economy and other branches of social development, on the one hand, and scientific and technical progress, the utilization of the achievements of science and technology in all spheres of the national economy and the participation of each worker in this work, on the other. Vladimir Il'ich pointed out that in order to achieve this it is necessary to create "technical equipment that is constructed according to the last word in the latest science . . ." (Vol 36, p 300). And that "It is necessary to take advantage of all science and technical equipment, all knowledge and art. Without this we cannot construct the life of a communist society" (Vol 38, p 55).

Lenin's work entitled "Draft of the Plan for Scientific and Technical Work" (Vol. 36, pp 228-231) played an exceptionally important role in the establishment of soviet science and the enlistment of scientists in the construction of a socialist society. It earmarked the main tasks in the development of material production and formulated the most important principles of the organization and activity of scientific institutions. V. I. Lenin repeatedly drew attention to the fact that the most important task in this area is to constantly bring scientific research closer to the solutions to the crucial problems of socialist construction.

The Essence of Scientific and Technical Progress Under Socialism

In our day, when the Communist Party and all Soviet are solving problems relating to further raising the standard of living of the people, implementing the USSR Food Program and changing the economy over to a primarily intensive path of development, the same urgency is attached to the words of V. I. Lenin that "The economist must always look forward in the direction of the progress of technology, for otherwise he will quickly become outdated . . ." (Vol 5, pp 137-138). This is precisely why all of our planning system for controlling the national economy is based on a long-term comprehensive program for scientific and technical progress.

The works of V. I. Lenin profoundly reveal the content of scientific and technical progress. It includes improvement of implements of labor--machines, equipment, means of transportation and all kinds of machine technology--and objects of labor--fuel, raw material, energy, processed materials--and also improvement of technology and the organization of labor and production. Scientific and technical progress is impossible without constant development of the society's main productive force--people, all those who work in the national economy. V. I. Lenin called upon the workers and peasants to master as quickly as possible the "higher technology of labor" (Vol 36, p.181).

The utilization of the achievements of scientific and technical progress is a decisive factor in facilitating labor and increasing its content. V. I. Lenin wrote, for example, that "electrification" of all factories and railroads will make working conditions more healthful, will relieve millions of the necessity to work in smoke, dust and dirt, and will accelerate the transformation of dirty disgusting shops into clean, light ones that are worthy laboratories for man" (Vol 23, p 94).

V. I. Lenin established the principle features of the utilization of the achievements of science and technology under socialism. Under capitalism scientific and technical progress is utilized for purposes of obtaining the most profit for the capitalist and acts as a means of increased exploitation of the masses and extensive militarization of the economy. In a socialist society, where public ownership of the means of production prevails, the economy develops in a planned and dynamic way in the interests of improving the material well-being and raising the cultural level of the workers and perfecting the socialist way of life. All the latest achievements of science and technology serve this noble purpose here.

Following Lenin's behests, our party and the soviet state devote constant attention to the development of science and technology. A powerful scientific potential has been created during the years of soviet power. In our country in 1981 more than 4 million workers and employees were employed in the sphere of science and scientific service, including 1.4 million scientific workers or one-fourth of all the scientific workers of the world. During the years of the 10th Five-Year Plan 97.9 billion rubles were spent on the development of science through all channels of financing, or 4.8 percent of the country's national income that was used during these years. Our party regards scientific and technical progress as one of the bases for the intensification of production. It exerts a decisive influence on all the main factors of intensive development of the economy and makes it possible to utilize more efficiently labor resources, fixed production capital and material resources, and to produce high-quality products.

Under the powerful influence of scientific and technical progress the material and technical base of communism is formed and developed. It, in turn, acts as a starting point from which the society takes new steps in the development of science and technology.

In a socialist society the progress of science and technology facilitates the labor of people. During the years of soviet power, and especially during recent five-year periods, the level of mechanization of work in all branches of the national economy has risen sharply. But, as a result of improvement of production, the higher general educational and occupational level of the working class and the improved public well-being, the demands for improvement of working conditions are constantly increasing. And approximately 40 percent of the workers in industry are still engaged in manual labor.

Under the current five-year plan great efforts are being exerted to significantly improve working conditions, especially in places where labor is still difficult and harmful to the health. Much is being done for labor safety. Expenditures on measures for the protection of labor amounted to 8.2 billion rubles under the 9th Five-Year Plan and 11.2 billion under the 10th.

In the first year of the 11th Five-Year Plan these expenditures amount to 2.6 billion rubles. In 1981 industrial injuries had decreased by 35 percent as compared to 1970. The USSR is among the countries with the lowest level of industrial injuries.

An important area in the work for raising the technical level of production is extensive introduction into production of various kinds of mechanized flow lines. During the past decade the number of these increased from 89,500 to 145,300, that is, 1.6-fold. During this period the number of automated lines increased 2.5-fold and the number of comprehensively mechanized sections, shops and industries--2-fold.

Industrial robots, whose output is considerably increasing, play no small role in facilitating labor. During the years of the 11th Five-Year Plan, according to calculations of specialists, no less than 70,000 workers will "be replaced" by mechanical workers in difficult jobs.

Creative Labor With Content

Under the influence of scientific and technical progress the very nature of labor changes. At the 26th CPSU Congress, L. I. Brezhnev emphasized: "The soviet society is a society of people of labor. The party and state has exerted and are exerting a good deal of effort to make man's labor not only more productive, but also more full of content, more interesting and more creative." Our country has done a good deal to achieve this.

Such enterprises as the Moscow motor vehical plant imeni Likhachev, the Kiev Arsenal, the Vologda Avtomash, the Riga VEF and Magnitka, the Leningrad porcelain plant, the Tiraspol sewing factory and many others can serve as an example of this. Moreover, concern for a high technical level of production and good working conditions are manifested both in the reconstruction of already operating industries and in the design and construction of new facilities.

Labor collectives play a large role in the acceleration of technical progress. It is precisely at the enterprises that the results of the achievements of science and technology are embodied in practice. It is important to take advantage of the valuable experience of the workers of Zaporozhye Oblast which was approved by the CPSU Central Committee. The collectives of the enterprises in the oblast are participating in a competition under the motto "Manual Labor on the Shoulders of Machines." Following their example, during the past five years the Ukraine has released more than 300,000 people from manual labor.

Constant attention is devoted to questions of technical re-equipment at the Ivanovo blended yarn combine. During the 9th and 10th Five-Year Plans the combine installed 3,200 units of new domestic equipment. Because of reconstruction, as early as September 1974 the combine reached the goals envisioned for the end of the 9th Five-Year Plan, as a result of which the collective received the heartfelt congratulations of L. I. Brezhnev. In 1980 as compared to 1970 labor productivity at the combine doubled, and working conditions and product quality improved appreciably. The number of industrial production personnel decreased from 9,438 to 7,306. Under the current five-year plan the combine has installed about 200 units of the latest technological equipment and modernized a considerable proportion of the existing equipment.

The combine's collective has adopted a counterplan for 1983 which is based primarily on intensive factors of the development of production. In particular, the plan envisions raising the level of fully mechanized labor at the enterprise to 73 percent.

Under socialism workers are vitally interested in the development and better utilization of technical equipment. The movement of efficiency experts and inventors for further technical improvement of production, mechanization of labor and improvement of working conditions has become widespread in our country. In 1981 alone more than 5 million efficiency proposals and applications for proposed inventions were submitted in the national economy. The economic effect amounted to 7 billion rubles.

Scientific and technical progress actively influences the expansion and updating of lists of products and the assortment of products that are produced. Under modern conditions the rates at which industrial products are updated are an important indicator of the technical perfection of the country's production potential.

Scientific and technical progress pervades literally all aspects of our life. It is now difficult to imagine life without household appliances, telephones, radios and television sets. Qualitatively new products are constantly appearing, which are meant to satisfy our material and cultural needs. Thus color television sets appeared relatively recently, and the creation of stereo television sets and many other cultural and domestic goods which are technically extremely complex are not far in the future.

In order to constantly change and update the list of products that are being produced, it is necessary to have the appropriate equipment. Machine tool lines are being replaced by machine tools with programmed control and so-called processing centers with program control. One of the most important advantages of equipment with programmed control is the possibility of relatively inexpensive and rapid readjustment of it for the production of different kinds of products. In 1965 our industry created a total of 49 machine tools with program control while in 1981 the output of these exceeded 10,000.

Production technology is also changing at rapid rates. Quite recently lasers were included in the list of "equipment for scientific research institutes" and now they are already being utilized extensively in industry.

Among the socioeconomic problems which we are solving primarily through the utilization of the achievements of science and technology one should single out the problem of the protection and restoration of our environment. Of course, in many cases machines and equipment that are technically new in principle are not required. It is sufficient to observe elementary rules of technological conditions, not to discharge production waste into rivers and other bodies of water, and so forth. But for a number of branches of industry this is really a technically complicated problem. It is necessary to have qualitatively new technical equipment and technology which will make it possible to obtain better results with fewer expenditures.

Extensive utilization in production of the latest achievements of science and technology makes it possible for us to successfully construct a material and technical base for communism and to maintain the defense of our country and the entire socialist community on the proper level.

Under the current five-year plan a large new step will be taken in all areas of scientific and technical progress. The 26th CPSU Congress set the task of bringing all branches of the national economy up to the leading levels of science and technology. It will be necessary to accelerate the re-equipment of the national economy on a new technical basis which corresponds to the most modern requirements and predetermines a high level of the material and technical base for tomorrow's production.

In order to raise production to the leading levels of science and technology a complex of measures will be carried out under the 11th Five-Year Plan. A leading position among them will be held by the creation and mass application of new and the latest technical equipment and technology, increased rates of technical re-equipment of branches of the national economy, comprehensive mechanization and automation of production processes, and an increased proportion of products of the highest quality category. A comprehensive program is being implemented on a broad front to reduce the amount of manual labor in the national economy and in all areas of production.

Scientific and Technical Progress and Efficiency

Increased efficiency of our economy is a basic political and economic task in the modern stage of development. The rates at which it is implemented determine the possibilities of accelerated improvement of public well-being and the solution to all social problems. Increased efficiency of public production as a whole and in each job is concretely expressed in increased labor productivity, improved product quality, reduced expenditures on each item and increased output of products per unit of fixed production capital.

The Basis of Increased Efficiency

Increased efficiency through the utilization of achievements of science and technology is thus a major and decisive factor which results in scientific and technical progress in a socialist society. Public production consists of many thousands of enterprises, associations, kolkhozes, sovkhozes, and construction, transportation and other economic organizations. Therefore increased efficiency of the activity of each enterprise and organization, each shop and section, each brigade--this is the basis of increased efficiency of our entire economy.

Improvement of implements and objects of labor, technology and production organization can take place in two main forms. In the first place, it can take place gradually, through more profound improvement of those types and kinds of technical equipment and technology which have been utilized in production for a relatively long time. Thus since the beginning of the 20th century there has been improvement in the main sets of equipment that comprise a thermal electric station--boilers, turbines and electric generators. During past decades extremely great success has been achieved. The efficiency factor of a large modern thermal station reaches approximately 36-38 percent. Calculations show that it is practically impossible to raise this above 40-42 percent. But the national economy needs more economical electric power stations. And designers are creating principally new types of generators of electric power--atomic and thermonuclear electric power stations. Our country is working successfully on their creation and improvement.

Similar examples can be given for practically all branches of material production. The changeover to the utilization of new kinds and sources of energy; the introduction of principally new technologies and methods of organization production; the discovery of means of creating materials with previously given qualities which do not exist in nature; the extensive

utilization in production, administration and science of electronic computer equipment--all these comprise what we call the scientific and technical revolution.

Table. Existence in Industry of Mechanized Flow and Automated Lines, Comprehensively Mechanized and Automated Sections, Shops, Productions and Enterprises (as of 1 July, thousands)

	1971	1975	1981
Mechanized flow lines	89.5	114.1	145.3
Automated lines	10.9	17.1	27.4
Comprehensively mechanized and automated sections, shops, industries	44.2	66.2	91.0
Number of comprehensively mechanized and automated enterprises	5.0	5.4	6.5

The peculiarity of the present stage of our country's economic development consists precisely in that modern development is inseparably related to the scientific and technical revolution that is taking place.

Sometimes people simply say that we live in the age of the scientific and technical revolution. There is no doubt that the introduction into production of technical equipment and technology that is based on new scientific principles is the most typical of the present stage. But one cannot forget the fact that not only today, but also tomorrow we shall operate and produce both principally new and traditional technical equipment. And both must be improved all the time.

In other words, the modern stage of scientific and technical progress involves the creation, production and utilization of both qualitatively new and traditional technical equipment. This was reflected in the Basic Directions for the Economic and Social Development of the USSR During 1981-1985 and the Period Up To 1990 and in the plans for the 11th Five-Year Plan. These documents, on the one hand, especially single out the creation and production of qualitatively new technical equipment (industrial robots, equipment with programmed control, electronic computers and so forth) and, on the other, more attention has been devoted to raising the technical and economic indicators of traditional technical equipment as well as modernizing it.

An important advantage of socialism is planned management of the national economy, which creates favorable possibilities for acceleration of scientific and technical progress. A socialist economy, in the first place, makes it possible to provide for planning the entire cycle of development and output of new technical equipment and to carry out this cycle more efficiently and rapidly.

In the second place a planned system of control of scientific and technical progress makes it possible to concentrate material and financial resources, the efforts of scientific collectives and the initiative of efficiency experts and inventors on the leading areas, based not only on current tasks of economic construction, but also on the future ones. In the third place an important advantage of the socialist system of management is the possibility of combining the efforts of sister socialist countries in conducting scientific research, planning, design and output of new technical equipment at specialized enterprises and the extensive utilization of this equipment.

In the modern world science and technology have become an important battleground for the competition between the two opposing socio-economic systems--capitalism and socialism. This is why our party has set a task of historic importance--to combine organically the achievements of the scientific and technical revolution and the advantages of the socialist system of management, and to reach the most advanced points of science and technology.

Unified Technical Policy

Regardless of how great the advantages of socialism in the area of scientific and technical progress may be, we need an immense amount of economic-organizational and party-political work in order to utilize these advantages, to adhere to a unified technical policy and to enlist all labor collectives, specialists and workers in the struggle for the acceleration of scientific and technical progress.

A unified technical policy is a scientific substantiated system of economic, organizational, educational and other measures which has the goal of revealing and utilizing in practice the most effective methods, forms and directions of the development of science and technology and ways and means of introducing scientific and technical achievements into production and other spheres of public life, as well as to create the most favorable conditions for this. Practice shows that these measures produce the greatest effect when they are developed centrally, with the participation of enterprises, and implemented in a planned way on the level of the entire country with all labor collectives participating in their implementation.

A comprehensive program for scientific and technical progress calculated for the next two decades and the corresponding sections of the five-year and annual plans for economic and social development--such are the main units that provide for control of scientific and technical progress and the implementation of the party's unified technical policy.

Under modern conditions the unified technical policy of the CPSU is directed toward solving two fundamental problems. First, there is constant, all-around technical renewal and improvement of material production. This means, in particular, mechanization of the majority of labor operations of mass production in basic and auxiliary industries. Second, there is solving the problem of bringing all branches of the country's economy up to leading technical positions. It was emphasized at the 26th CPSU Congress that the new technical equipment that is being introduced should correspond to the best world and domestic models, and that we should settle for nothing less.

It is important to note that successful implementation of the party's unified technical policy depends not only on large-scale state measures, but, to a considerable degree, on the attitude toward the matter and the concern of each soviet worker for the development of the enterprise and his participation in the mechanization of labor operations in his own job and in his own shop and enterprise. Thus great possibilities appear with the changeover to brigade forms of organization and stimulation of labor.

Under modern conditions the worker must have sufficient training to rapidly master technical equipment and fully take advantage of its possibilities to increase labor productivity and improve product quality. The worker must constantly increase not only his occupational, technical and economic knowledge, but also his general educational knowledge, and raise his overall cultural level. While before the Great Patriotic War only 8 percent of the workers had a seventh-grade education and higher, in 1981 the proportion of workers with a secondary (complete and incomplete) and higher education amounted to about 79 percent.

The general educational level of the working class is also rising as a result of graduates of schools and vocational and technical institutions. The most promising of these are vocational and technical schools which provide a general secondary education. From 1970 through 1981 the number of these increased 7.5-fold, and the number of students in them increased from 180,000 to 2,243,000. The 26th Party Congress set the task of increasing the training of skilled workers with a secondary education 1.6-fold under the 11th Five-Year Plan.

The party devotes primary attention to obtaining the greatest return in the shortest possible period of time from labor, material and financial resources, including those utilized in the sphere of scientific research and experimental design developments and from expenditures on the introduction of the achievements of science into production. It is very important for the country, and this should be emphasized, to obtain more rapidly a maximum final national economic result from scientific and technical progress.

The final result of scientific and technical progress is highly productive technical equipment, advanced technology, and scientific organization of production and labor in all spheres of the economy. This means the maximum possible (naturally, within the limits of reason) saturation of enterprises and working positions with new machines and equipment so that the economic indicators of the operation of enterprises, branches and the national economy as a whole will constantly improve.

Progressive new technical equipment is the main means of increasing labor productivity. And it is very important when it is introduced for labor productivity to increase more rapidly than the technical equipment for labor does. Only then will the output-capital ratio increase. So far the availability of technical equipment for labor in material production is increasing more rapidly than productivity is. An increased output-capital ratio is an important condition for changing over to a mainly intensive type of economic growth and to acceleration of the increase in the effectiveness of public production.

The development of scientific and technical progress depends largely on improvement of the organizational forms of combining science and production. Rapid introduction of the achievements of science and technology will be promoted by the strengthening and development of ties between enterprises and the leading scientific centers of the country, creative cooperation between production workers and scientists and workers of the leading design and technological bureaus, the creation of creative brigades of workers and specialists at enterprises, and close interaction among all services of the enterprise. A large contribution to advancing production to the leading positions of science and technology should be made by scientific and technical societies, efficiency experts and inventors.

An important means of integrating science and production and accelerating the rates of scientific and technical progress is to create scientific production associations. At the present time the country's industry has more than 250 of these associations. Among the most successful of them are the Leningrad Svetlana and Pozitron associations, the Moscow experimental scientific research institute of metal cutting machine tools, the Okhtinsk Plastpolimer and the Odessa Pishchepromavtomatika.

Planning New Technical Equipment

In the totality of means for accelerating scientific and technical progress a major role is played by socialist planning as the main unit of the entire system of administration of the country's national economy. The decree of the CPSU Central Committee and the USSR Council of Ministers, "On Improving Planning and Stepping Up the Influence of the Economic Mechanism on Increasing Production Efficiency and the Quality of Work," of 12 July 1979 established a well-arranged system of state planning which also embraces scientific and technical progress.

First of all one must discuss the comprehensive program for scientific and technical progress which has become the main form of long-term planning in the USSR. The preparation of this program is the responsibility of the USSR Academy of Sciences, the USSR State Committee for Science and Technology and the USSR Gosstroy. This program encompasses the period up to the year 2000 and will be extended for five years with each subsequent five-year plan.

The role of the five-year plans in planning the development of science and technology have increased. Thus the plan for the 11th Five-Year Plan has a special section entitled, "The Development of Science and Acceleration of Technical Progress." It earmarks the main assignments in this branch during 1981-1985.

A special place in this section is occupied by comprehensive programs for solving the most important scientific and technical problems. The purpose of this kind of program is to satisfy the needs of the national economy for principally new kinds of technical equipment. It encompasses fundamental and applied research, experimental and design developments in a particular area, and the creation, if necessary, of the corresponding enterprises for the production of the new kinds of products.

Under the 11th Five-Year Plan 170 comprehensive scientific and technical programs are being carried out. Their implementation will make it possible to save the labor of millions of workers, billions of kilowatt-hours of electric power and millions of tons of fuel and metal, and to obtain as a result of this an economic effect of 16 billion rubles.

The 11th Five-Year Plan also determines the amount of money to be invested in the development of science and technology. It is important to pay attention to the fact that our growth rates of expenditures on scientific and technical progress are higher than the growth rates of the national income: From 1970 to 1981 the country's national income increased 1.68-fold while expenditures on science increased almost 1.9-fold.

The contribution of the country's leading labor collectives to the acceleration of scientific and technical progress is great. An immense amount of experience in this work has been accumulated by the Leningrad Elektrosila association. The Elektrosila collective is waging a persistent struggle for improving the designs of turbo- and hydrogenerators and reducing the expenditure of metal per kilowatt of capacity of the machines. While the expenditure of metal per kilowatt of capacity for hydrogenerators at the Bratskaya GES was 5.9 kilograms, for hydrogenerators at the Sayano-Shushenskaya GES it was only 2.9 kilograms. All services of the association are making their contribution to the matter of economizing on metal. At the suggestion of technologists, for example, combined operational cutting of rolled sheet metal was introduced for the Odessa automated machines for photocopy cutting (a savings of 220 tons per year) and stamping was changed from sheet steel to roll steel using automated stamping lines (savings of 840 tons a year). Under the 11th Five-Year plan the collective is committed to providing for the entire increase in output without additional rolled metal. During the first half of 1981 alone, as a result of the implementation of hundreds of suggestions from workers they saved 1,653 tons of ferrous and 88 tons of nonferrous rolled metal.

The planning of scientific and technical progress is related to a greater degree than before to the planning of the output of products and capital construction. The assignments for the ministries and departments earmark the proportion of items of the highest quality. The activity of the labor collectives in this area is evaluated not only in terms of the volume (quantity) of measures that are implemented for the introduction of new technical equipment and technology and the updating of production equipment, but also in terms of the economic or social affect achieved as a result of their implementation. In order to carry out these tasks many industrial ministries have created a unified fund for the development of science and technology from which scientific research and design work is financed and expenditures related to the development and assimilation of new technical equipment are reimbursed.

It is impossible to implement a unified scientific and technical policy without the utilization of various kinds of normatives which regulate the activity of scientific organizations and enterprises that create and produce new technical equipment. A leading role among these kinds of

documents is played by the methods for determining the economic effectiveness of new technical equipment and the method for determining the economic effectiveness of capital investments, which establish the minimum level of effectiveness of new technical equipment and capital construction as early as the stage of planning and design. (EKONOMICHESKAYA GAZETA, No 10, 1977 and Nos 2 and 3, 1981).

Moreover, there are branch methods of determining economic effectiveness. They make it possible not only to calculate the level of effectiveness of scientific and technical progress at the enterprise, but also to determine the possibilities of more efficient operation of a given machine tool, set of equipment or other machine.

The passport of the associations and enterprises have become for the labor collective an important instrument for evaluating the potential possibilities of better utilization of equipment, production areas, raw materials, processed materials and fuel. An objective description of the production capacities helps to reveal reserves for increasing production as a result of technical reconstruction and the elimination of bottlenecks. Interesting experience in the development of such passports both for the enterprise as a whole and for each shop has been accumulated by the Sumy Machine Building Association imeni M. V. Frunze. In many labor collectives passports are drawn up for the working positions. Thus at the Chernigov plant for automotive spare parts, on the basis of the use of passports for working positions, they have successfully implemented measures for a significant reduction of the volume and proportion of manual labor.

Scientific and Technical Progress and the Well-Being of the People

The highest goal of the policy and practical activity of our party is to show concern for the soviet man and for the good of all the people. And it is natural that all of the achievements of scientific and technical progress and all the possibilities of material production are utilized under socialism in order to achieve this. This is especially apparent when speaking about further development of branches of the agro-industrial complex and the production of consumer goods. Well, how does one understand this point when we are speaking, for example, about the metallurgical, fuel, energy or electronic industry? The products of these branches--iron and steel, coal and petroleum, computer equipment--also, in the final analysis, are created in order to produce agricultural products, clothing and footwear and to construct residential buildings.

Under socialism the purpose of production is radically different from that of capitalism. Socialism subordinates it to the interests of the workers. Under the conditions of capitalism production is a direct means by which the owners of the enterprises obtain profit. The economic effect of our production is at the disposal of the entire society while in capitalist countries it belongs to the exploiting classes.

Bourgeois ideologists try to blame science and technology for all the vices inherent in a capitalist society--unemployment, inflation, and the lack of rights of the workers. The experience of real socialism convincingly refutes

these false assertions. In our country scientific and technical progress truly serves noble causes of facilitating labor, filling it with creative content and enriching the lives of all people of labor.

Resources of the Social Program

In the modern stage of development of the soviet society increased effectiveness of production has become the main source of increased resources for further improving public well-being and implementing a broad social program. In turn, as was already noted, the progress of science and technology is a powerful factor in increasing the effectiveness of our economy.

For the 11th Five-Year Plan and the 1980's as a whole, the party has set forth a broad program for further improving the well-being of the people. This program includes improving all aspects of the life of soviet people: consumption and housing, culture and recreation and the conditions for labor and life.

Improved well-being means primarily increasing the real per capita incomes. From 1965 through 1981 they more than doubled.

The increase in real income is the result and at the same time one of the essential factors in increasing the productivity of public labor.

Under modern conditions increasing labor productivity in industry, agriculture, construction, transportation and other branches of material production depends largely on the degree to which production is provided with new technical equipment, the perfection of technology and the organization of labor and production.

In order to get a clearer idea of how real per capita incomes increase under the influence of scientific and technical progress let us look at some of the main constituent parts of it. The first one is wages. Since 1965 the average monetary wages of workers and employees increased 1.75-fold, and of kolkhoz workers--2.31-fold. During the period of 1981-1985 the average monthly wages are to increase by another 14.5 percent and the wages of kolkhoz workers--by 20 percent. This is a direct result of increased labor productivity on the basis of the utilization of the achievements of science and technology and advanced practice. Introducing new technical equipment and conducting measures for scientific organization of labor in 1971-1980 provided for 67 percent of the increase in labor productivity in industry.

An immense advantage of socialism is the fact that the well-being of each member of the society is also influenced by public consumption funds. From these the population is provided with free education and training, free medical aid, stipends, pensions, grants for students, annual paid vacations, trips to sanatoriums and houses of recreation free of charge or at reduced prices, care for children in preschool institutions and a number of other payments and benefits. While in 1965 payments and benefits received by the population from public consumption funds amounted to 41.9 billion rubles, in 1981 this amount reached 122 billion rubles. The annual per capita amount increased from 182 rubles to 456 rubles.

Increased payments and benefits from public consumption funds are closely related to increased efficiency of public production and increased productivity of the labor of each worker. Moreover, a considerable proportion of the funds paid to the workers are directly dependent on the results of their past and present labor (pensions, paid vacations and paid sick time).

Scientific and technical progress plays a large role in implementing the USSR Food Program which was approved by the May (1982) Plenum of the CPSU Central Committee. Important conditions for its successful implementation are acceleration of scientific and technical progress, highly effective utilization of the production potential and strengthening of the material and technical base of agriculture and all branches of the agro-industrial complex on the basis of further development of mechanization and chemization of production and extensive land reclamation.

The program envisions further improvement of the quality and structure of the machine and tractor fleet. A major area here is to change machine building plants over from the production of individual machines to the production of sets of machines that make it possible to provide for flow line production technology.

The technical potential of agricultural enterprises will be increased under the 11th and 12th Five-Year Plans by delivering to agriculture modern mounted and trailer machines and implements that are used in combination with high-power tractors. During the 1980's there will be more deliveries of other technical equipment for animal husbandry farms and processing enterprises. This will make it possible to eliminate the gaps in comprehensive mechanization to a considerable degree and provide for conducting agricultural work within the optimal time periods. Highly efficient technical equipment will be the basis for the introduction of resource-saving technologies.

Industry of the Nonproduction Sphere

As we know, the so-called nonproduction sphere plays a significant role in improving public well-being and the socialist way of life. It includes public health, physical education, social security, public education, culture, art, housing and municipal services, consumer services and a number of other branches of the national economy. In 1980 more than 30 million workers were employed in the nonproduction sphere, which amounts to 26 percent of the people employed in the national economy. A considerable proportion of the fixed capital of the national economy (34.1 percent) is used in the nonproduction sphere.

Raising the technical level of the nonproduction sphere involves large expenditures and, consequently, it is necessary to take advantage of scientific and technical progress in all ways in order to carry out this task more effectively. At the same time one should keep in mind that the nonproduction sphere and the strengthening of its material base contribute to the process of public reproduction in three main areas.

In the first place, increased availability of technical equipment for the labor of workers of this group makes it possible to increase the effectiveness of their functioning and, consequently, the functioning of all public reproduction.

In the second place, improvement of education, rearing of the younger generation, and medical service for the population provides for a significant increase in the qualifications of all workers and increased productivity of their labor as well as more complete and efficient utilization of the production potential of the socialist society. As calculations show, during the past two decades about 30 percent of the increase in the national income resulted from the higher level of education and skills of the workers.

In the third place, rendering the most varied kinds of cultural and domestic services to the population is an important factor in increasing the amount of free time of the workers and allowing them to use it more productively, which is an indispensable condition for the all-around development of the personality.

Environmental Protection

Efficient utilization of natural resources and protection of the environment are among the most important national economic problems on whose successful solution improved public well-being and improvement of the living conditions of the soviet people directly depend. "We must," said L. I. Brezhnev, "preserve and beautify our land for present and future generations of soviet people. The more intelligently we utilize the riches of nature, the greater the successes we achieve in industry, agriculture and science, the greater the productivity of public labor, the richer, more beautiful and more cultured the life of the soviet people will be."

Questions of protecting nature and its efficient utilization and transformation on a scientific basis in the interests of the entire society in our country constitute an important part of the socio-economic policy of the Communist Party. A special section is devoted to this in the Basic Directions for the Economic and Social Development of the USSR During 1981-1985 and the Period Up To 1990.

Expenditures on the protection of our environment are constantly increasing. Just state capital investments in measures for protecting nature and efficiently utilizing natural resources amounted to 6.2 billion rubles during the years of the 9th Five-Year Plan and more than 9 billion rubles during the 10th Five-Year Plan. During the first year of the current five-year plan they amounted to the immense sum of 1.8 billion rubles.

Additionally, further development of work for environmental protection on a national economic scale, taking into account the dynamic development of socialist production, sets for scientists, labor collectives and workers a number of new scientific and practical tasks. On the one hand, in places where the natural system has the capacity for self-renewal, when production is developed one cannot exceed the level of pollution that is greater than the capacities of nature for self-purification. On the other hand, it is

necessary to make maximum use of the achievements of scientific and technical progress, primarily new types of waste free technologies that have now been developed as well as economically and ecologically effective purification installations in order to avoid damage to nature.

Taking into account the possibilities of modern development of science and technology, one can single out two main paths for effectively fighting against pollution. The first is more complete purification of wastes of industrial and agricultural enterprises. The purification installations that have been created in our country at many enterprises of metallurgy, chemical, the pulp and paper, energy and other branches of industry provide for a high degree of purification of industrial wastes. But one cannot be distracted from the fact that they are extremely costly and do not solve the problem completely.

Thus the proportion of expenditures on purification installations in capital investments for the construction of a number of large industrial facilities reaches 20 percent and more. To this one should add that they usually occupy considerable areas of land.

The second path is considerably more effective. Its essence consists in the creation of technologies with little or no waste which make it possible, in the final analysis, to use all substances that are harmful to nature and man for the needs of the given enterprise or related ones. Far from all scientific and technical problems in this area have been solved yet. But in the future the latest achievements of science and technology will make it possible to cope with them successfully.

It is necessary to create special industries for producing the appropriate equipment. This requires time and resources. But even now one can speak of considerable achievements in this area. Oil refineries whose designs were created at the end of the 1950's envisioned the expenditure of 7-8 cubic meters of fresh water per ton of petroleum that was processed, and the plans from the end of the 1960's envisioned one-fourth-one-eighth of a cubic meter, that is, approximately one-thirty-second-one-sixty-fourth of the previous amount. Discharges that are harmful to nature are to be completely eliminated at new enterprises of this branch.

One of the most important construction projects of the 11th Five-Year Plan is the Oskol'skiy electrometallurgical combine. There it is intended to utilize technology with little waste for directly obtaining steel from metal pellets which, in addition to protecting nature, will produce a considerable economic effect. At the Balkhash and Noril'sk mining and metallurgical combines they will introduce installations for treating sulfide raw material in a liquid bath utilizing sulfur, which prevents the discharge of sulfur anhydride into the atmosphere and improves the economic indicators of the technological process.

Problems of environmental protection are solved differently in capitalist countries. It would be incorrect, of course, to think that the governments of the United States, Japan, the FRG and other developed capitalist countries are doing nothing about this. But their measures are clearly inadequate and

have been curtailed recently. A convincing example is the economic program of the American President R. Reagan. This program reduces by 2.3 billion dollars the expenditures on the energy program, environmental protection and measures to protect the labor and health of the population. At the same time in the United States, according to the same data, 140 million Americans live in regions where the quality of the air does not meet the standards of an environment that is safe for the health of man.

When considering statewide and branch measures for protecting the environment one cannot forget about the fact that success in their implementation, the effectiveness of each purification installation and the safety of each technological process that is carried out finally at each working position depend on specific workers. Practice shows that in many cases discharges of harmful production wastes into the air and water basins depend not on imperfect technological processes, but on violations of these and on an inadequate understanding of the economic and social significance of fighting to protect our environment.

In our country the matter of environmental protection is the concern of all workers and each soviet man.

The entire course of historical development indisputably demonstrates that only under socialism can the achievements of science and technology work for the good of all the people.

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UKRAINIAN PARTY-ECONOMIC AKTIV MEETING ON SCIENTIFIC AND TECHNOLOGICAL PROGRESS

Kiev PRAVDA UKRAINY in Russian 17 Apr 82 pp 1-3

[Information Report: "The Economy at the Front Lines of Science and Technology: From a Republic Meeting of the Party-Economic Aktiv"]

[Text] The close integration of science and production and a strengthening of the alliance between creative thought and creative labor is a very important condition for the successful fulfillment of the assignments of the 11th Five-Year Plan. The task is to make full use of our scientific potential in order to further intensify all of the branches of the economy. This was emphasized at a republic meeting of the party-economic aktiv which took place on 15 April in the Session Hall of the Ukrainian SSR Supreme Soviet.

Party and government workers, leaders and specialists from the UkSSR ministries and departments and enterprises and associations, and production innovators were invited to the meeting.

The following comrades took part in the work of the meeting: V. V. Shcherbitskiy, A. F. Vatchenko, G. I. Vashchenko, I. A. Gerasimov, A. P. Lyashko, I. A. Mozgovoy, I. Z. Sokolov, V. A. Sologub, A. A. Titarenko, V. V. Fedorchuk, V. F. Dobrik, Yu. N. El'chenko, A. S. Kapto, Ye. V. Kachalovskiy, Yu. A. Kolomiets, and Ya. P. Pogrebnyak--members of the CPSU Central Committee; the President of the USSR Academy of Sciences A. P. Aleksandrov; the President of the UkSSR Academy of Sciences B. Ye. Paton; the Vice President of the USSR Academy of Sciences P. N. Fedoseyev; the Candidate Member of the CPSU Central Committee and Vice President of the USSR Academy of Sciences Yu. A. Ovchinnikov; the First Deputy Chief of the Science and Educational Institutions Department of the CPSU Central Committee S. G. Shcherbakov; and the Deputy Chairman of the USSR State Committee for Science and Engineering V. M. Kudinov.

The Member of the Politburo of the CPSU Central Committee and First Secretary of the Central Committee of the Communist Party of the Ukraine Comrade V. V. Shcherbitskiy delivered the report "On the Fulfillment of the Decisions of the 26th CPSU Congress and the 26th Congress of the Communist Party of the Ukraine Regarding an Acceleration of Scientific and Technological Progress and the Strengthening of the Connections Between Science and Production."

(Comrade V. V. Shcherbitskiy's report was published in the 16 April issue of the newspaper.)

The speakers concentrated their attention on increasing the effectiveness of scientific research, on the most rapid realization of its results in the economy, strengthening the collaboration between science and practice, and increasing the responsibility of the leaders of ministries and departments, enterprises, institutes, party committees, and primary party organizations for the most rapid mastery of scientific developments and for a rise in the technical level of production.

The floor was given to the Candidate Member of the Politburo of the Central Committee of the Communist Party of the Ukraine and First Secretary of the Kiev party gorkom Yu. N. Yel'chenko. The report by Comrade V. V. Shcherbitskiy, he said, presented a broad panorama of the work of the republic's party organizations to realize the task set by the 26th CPSU Congress of accelerating scientific and technological progress as the decisive condition for achieving the highest labor productivity and for improving, on this basis, the people's well-being. The comprehensive and profoundly reasoned, party-principled and manner and statesman-like breadth of the posing of the problem will undoubtedly give rise in party organizations and in scientific and production collectives to an endeavour to be more persistent in seeking ways to accelerate the practical realization of today's scientific and technical achievements. And this, in its turn, will help to accomplish the task in such a way that, as Comrade L. I. Brezhnev emphasized at the 17th Congress of Soviet Trade Unions, these achievements will be used not in general, but concretely, in application to a given workplace in order to reduce manual labor to a minimum and release "extra" people who are in no way extra in our country and are desperately needed at other sectors.

The review of the introduction of scientific achievements into production which took place in Kiev, as it did in the entire republic, it was said in the speech, once again convincingly demonstrated what an enormous scientific and technical potential is possessed by Kiev and how great the responsibility is above all of party committees and party organizations for its effective use. The chief result of the review is that it gave a marked impulse to increasing the activity of cadres. And the importance of the subjective factor in speeding up scientific and technological progress is very very great. Success here depends to a large and frequently to a decisive extent upon the position of the executor, scientist, designer, planner, director, and minister. And if we are to speak about the basic means of party influence on accelerating scientific and technological progress, it consists above all in work with cadres, in increasing their responsibility, in creating a psychological turning point in the consciousness, and in a more exacting appraisal of their personal contribution to the practical accomplishment of scientific and technical tasks.

Yu. N. Yel'chenko described the work being performed at the city's enterprises to reduce manual labor, mechanize and automate production, and introduce robot equipment. One of the seven operating overall special-purpose programs is

subordinated to this goal. The very great importance of thoroughly economizing material resources, particularly metal, was emphasized. In this connection, the question was raised of the necessity for an extensive replacement in civil construction of metal piping with plastic piping. The proposal was made to grant broader rights to inter-departmental agencies in dealing with the concrete questions of scientific and technological progress.

In his address the UkSSR Minister of Ferrous Metallurgy D. P. Galkin characterized the chief directions of scientific and technological progress in his branch whose work to a substantial degree determines the increased efficiency of social production. Metallurgists see their basic task in producing such types and brands of steel and such an assortment of rolled goods which will ensure the saving of metal in the economy. The speaker described the work being done to realize the republic's overall scientific and technical program "Metal" whose fulfillment will make it possible to economize more than two million tons of metal in 1985.

His speech also dealt with the search for new technological processes which will make it possible to obtain metal output with smaller expenditures of raw materials, materials, and labor resources. The extensive introduction of programmed special-purpose planning and of scientific and technological progress should promote the accomplishment of this task. The enterprises and organizations of the Ministry of Ferrous Metallurgy are fulfilling assignments for 147 scientific and technical programs of various levels. In particular, a complex of work is being carried out to reduce the expenditure of coke for the smelting of iron by means of increasing the blasting temperature, to increase the expenditure of natural gas and mazut in coal dust fuel, and other measures. A substantial place in the speech was devoted to increasing the efficiency of mining equipment and of blast and open-hearth furnaces, to a zealous use of metal in the economy, and to reducing waste in the production of metal products.

A. Ya. Kolesnikov, the team leader of a team of working face miners at the "Molodogvardeyskaya" Mine of the "Krasnodonugol'" Association, said in his speech that the republic's miners, like the entire Soviet people, ardently approve and support the Leninist policies of the Communist Party and are enthusiastically working on the realization of the decisions of the 26th CPSU Congress and the November (1981) Plenum of the CPSU Central Committee. He reported that the team he leads mined 714,000 tons of coal last year and that 114,000 tons of this was above-plan, and that it is now preparing to celebrate the 60th anniversary of the formation of the USSR with new labor gifts.

The celebrated miner who has worked in the coal industry for 35 years emphasized that during this time the branch had covered a path from the cutting machine with a productivity of 100-150 tons a day to the present-day hydraulic complex with which more than 2,000 tons of coal a day are mined. At the same time, he emphasized the necessity for accelerating the development and introduction of equipment with characteristics which correspond to the greater complexity of the geological conditions of the Donbass, and for increasing the

reliability of the mine shaft equipment and mechanized bracings. Powerful combines and complexes and highly efficient tunnelling equipment are needed.

The President of the USSR Academy of Sciences Academician A. P. Aleksandrov spoke at the meeting. He reminded his listeners that the 26th CPSU Congress had attributed enormous importance to an acceleration of the introduction of scientific developments into production. In this connection, the speaker noted the important role of the meeting of the republic's party-economic aktiv which would help scientists, engineers, and production leaders in accelerating scientific and technological progress.

A large place in the speech was assigned to those directions of scientific research upon whose development the progress of the most important branches of the economy and, above all, of machine building substantially depends. It is necessary to persistently increase the reliability of machinery and equipment, lengthening their service life, and to decrease the metal intensiveness of equipment. This requires, in particular, a more precise grading of metal and a decrease in the number of standards in machine building. Another effective route is to introduce effective methods of strengthening the surfaces of metal products and increasing their corrosion resistance. The wide use of powder technologies is opening up broad prospects. For example, definite experience has already been gained at the enterprises of Sel'khoztekhnika in restoring worn-out parts with the help of powder technologies. They serve after this 3-5 times longer than usual.

A. P. Aleksandrov stopped to consider the mechanization and automation of production as an important lever for increasing its efficiency. He pointed to the necessity for developing a single series of electronic computers and for the unification of computer equipment which will make it possible to simplify servicing it and will facilitate the training of cadres. The question was raised of increasing the reliability of the equipment which is used for automation.

In his speech he also discussed the problem of strengthening the laboratory base for research. The speaker noted, in particular, the work that is being done in this direction in the Institute of Physiology imeni A. A. Bogomolets of the UkSSR Academy of Sciences. The instruments which are being created here are being used not only by Kiev scientists, but also by researchers from other scientific centers in the country. As a result, the necessity for buying expensive foreign equipment has been obviated.

Our scientific potential, the president of the USSR Academy of Sciences said, is sufficient to accomplish literally any task which can be set before Soviet science and industry. This is confirmed by the fulfillment of the major programs for the development of space and computer equipment and of others which show that success is ensured here when there is a concentration of forces and resources and the unification of the representatives of the most diverse directions of science and of production workers.

The importance and timeliness of the measures being carried out in the republic on the initiative of the Central Committee of the Communist Party of the Ukraine to improve the leadership of scientific and technological progress was emphasized in his speech by the Candidate Member of the Politburo of the Central Committee of the Communist Party of the Ukraine and the First Secretary of the Dnepropetrovsk party obkom Ye. V. Kachalovskiy. These measures, he said, have made it possible to substantially increase the efficiency of scientific institutions and industrial enterprises and to markedly expand the arsenal of the forms and methods of influence by party committees on the reequipping of production.

The introduction of new equipment and new technological processes and the modernization and reconstruction of enterprises is at the center of the attention of the oblast's party organization. The necessity for solving large regional problems has demanded the wide use of the methods of special-purpose planning and management and the creation of the regional overall scientific and technical programs--"Ruda," "Stal'," "Urozhay," and "Zdorov'ye."

Remembering Comrade L. I. Brezhnev's statement regarding the importance of accelerating scientific and technological progress which he made at the 26th CPSU Congress, the oblast's party organizations, it was said in the speech, are striving in every way to assist in the development of science and to do everything possible to strengthen the connections between scientific and production collectives and the republic's Academy of Sciences. Examples were cited of the close and fruitful cooperation between the workers of the enterprises of the Pridneprov'ye and specialists from the institutes of the UkSSR Academy of Sciences in creating waste-free technologies, improving and protecting the environment of Dneprodzerzhinsk, the efficient use of the minerals of the Krivoy Rog Basin, and an intensification of agricultural production. The speech raised a number of questions of the reequipping and reconstruction of metallurgical and mining enterprises which require the solutions of union and republic agencies.

"The Highest Yield for the Production and Scientific Potential"--it is under this slogan that the "Khar'kov Tractor Plant imeni S. Ordzhonikidze" Production Association is waging a struggle for an acceleration of the development and introduction of new equipment and progressive technology. This was described in the report of the General Director of the association V. V. Biblik. The additional mechanization and automation of production and the introduction of scientific achievements made it possible for the enterprise collective during the 10th Five-Year Plan and the first year of the 11th to obtain its entire increase in output without increasing the number of workers but on the basis of an increase in labor productivity. New automated lines have been introduced into production as has a plasma dusting sector at the "Bulat" Units, mechanization equipment is being perfected, and robots are being introduced.

The speaker devoted a large amount of attention to the completion during the current five-year plan of the creation of capacities for the production of energy-saturated tractors. The scientific and technical program on the problem

of the T-150 tractor and the SMD-60 engine provides for an increase in service life and in engine life of 1.5 times.

The review of the introduction of scientific achievements into practice which was performed in the republic, the President of the UkSSR Academy of Sciences Academician B. Ye. Paton said in his speech, once again has demonstrated the necessity for a further improvement of the mechanism of the introduction of science and production, for the elimination of interdepartmental barriers to scientific and technological progress, and for the creation of genuinely creative collectives of scientists and production workers. It is important for enterprise leaders and production workers to strive more to keep in step with technological progress so that they can work creatively with scientists.

The president of the UkSSR Academy of Sciences emphasized the important role of forecasting the development of the country's economy. Note was taken in particular, of the importance of the republic overall scientific and technical progress program and its social and economic consequences which will reach to the year 2005. On the one hand, it has to provide a clear prospect of the development of the base branches of the economy and, on the other, it has to concretize the possible variants of the solutions of economic and social problems. A necessary condition in developing it is an orientation toward the latest scientific achievements. This program has to be closely coordinated with the analogous union program and become a document whose realization within the five-year plans for economic and social development will ensure the planned use of scientific achievements and unite the efforts of science and production in the accomplishment of the task of intensifying the economy which has been put forward by the 26th Party Congress.

Attention was called in the speech to the importance of working out overall multi-purpose technologies which take account of the interests not of a single branch or an individual production, but which are oriented towards the achievement of a general national economic effect. This kind of experience already exists. Thus, as a result of the utilization of blast furnace slag the "Azovstal'" Plant produces 8 million rubles worth of commodity output which is used in the production of fertilizers and construction materials. And a new shop has been erected at the site of the previous slag dumps. Attention was called to the reserves which exist in the republic for increasing the production of piping for main gas pipelines.

The oblast party organization, the First Secretary of the Zaporozh'ye obkom M. N. Vsevolozhskiy said, is devoting especial attention to improving the organizational forms of the management of scientific and technological progress, and to the selection and education of cadres of economic leaders and party workers. Councils for assistance to scientific and technological progress are functioning at the obkom and at the gorkoms and raykoms. Overall special-purpose programs have been developed and are being carried out for the most important problems. As a result, labor productivity is increasing, the quality of finished products is improving, and expenditures of fuel and energy and raw material resources are decreasing. The proportion of highest quality category output in total production has exceeded 21 percent, and more than 80 percent of the increase in industrial production is being achieved on the basis of an increase in labor productivity.

A large place in the speech was devoted to the use of progressive technology at ferrous metallurgy and motor construction enterprises, and to the introduction at the construction of atomic electric power stations of a flow line technology which ensures a decrease in materials intensity and specific labor expenditures. The speaker described the cooperation between the oblast's enterprises and the institutions of the UkSSR Academy of Sciences in decreasing manual labor, and emphasized the necessity for coordinating this work on an inter-branch scale and for considering in the evaluation of one or another technical solution not only its economic, but also its social aspect.

Information on measures being carried out to increase the equipment level of the Donetsk Railroad was provided by its chief A. M. Kozhushko. For the purpose of repairing the parts and units of rolling stock 203 conveyor flow lines, 268 mechanized positions, and 25 mechanized points have been created and introduced here. The release of cars from repairs has been increased by 67,000 cars a year. The acceleration of technological progress has been fostered by the creative collaboration between railroad workers and the scientists of transportation VUZES and scientific research institutes.

However, the speaker noted that there were a number of problems in transportation which require an urgent solution. It is necessary to increase the production of thermally strengthened rails which will permit a twofold increase in their service life. Machine builders have to speed up the development and series production of new locomotives with various functions. In order to speed up the delivery of freight and reduce the cost of shipments it is important to have a more rational distribution of shipments among railroad, maritime, river, and motor vehicle transport.

The Chairman of the Western Scientific Center of the republic's Academy of Sciences Academician of the UkSSR Academy of Sciences Ya. S. Podstrigach characterized the system of interaction between scientific and production potentials which has developed in the region. The interdepartmental scientific production complexes which were created here five years ago on a contract basis have become an effective form of the realization of large-scale special-purpose programs and of the fulfillment of the overall scientific and technical and socio-economic work plan of the UkSSR Academy of Sciences for the enterprises and organizations of the western oblasts of the Ukraine for the five-year plan. Last year alone around 1,000 development projects with an economic effect of more than 280 million rubles were introduced into practice.

At the same time, the speaker noted that the republic review had confirmed the necessity for a further improvement of the regional system of managing scientific and technological progress. In this connection, the scientist pointed to the promising nature of cooperation between institutes with an agricultural profile and a specific agricultural area. He emphasized the necessity for increasing the responsibility of economic leaders for the use of scientific and technical achievements, and the importance of a further expansion of cooperation between scientific research institutions and VUZES in the accomplishment of important scientific and economic tasks.

The Deputy Chairman of the UkSSR Council of Ministers S. I. Gurenko said in his address that in directing and coordinating the work to develop science and technology the republic's Council of Ministers is guided by the decrees of the 26th CPSU Congress on the subordination of scientific and technical policy to the accomplishment of the chief task--the completion of the economy's shift to a primarily intensive path of development. The system of managing scientific and technological progress and the forms and methods of the work of government and economic agencies and of scientific institutions are being perfected. The program special-purpose method of management is being widely used. Planned work is being performed to introduce new technologies and machines and mechanisms and to reduce manual labor, and control over the work of scientific research institutes has been strengthened. The republic review of the introduction of scientific achievements into production which was held under the leadership of party committees will help to accelerate scientific and technological progress.

At the same time, the speaker noted that in 1981 the increase in labor productivity in industry based on the use of new equipment and production technologies and on production automation was insufficient. The reason for this is the weak orientation of scientific and technical policy in individual branches toward an intensification of production. The UkSSR Ministry of Light Industry and Ministry of the Meat and Dairy Industry and their corresponding branch institutes have not been showing the necessary persistence in dealing with the questions of production mechanization.

The address discussed the measures being taken in the republic to overcome departmental disunity in the matter of accelerating scientific and technological progress. This is the target above all of the development of the program's special-purpose approach and of the strengthening of regional--oblast and city--elements of the management of scientific and technological progress. The speaker emphasized the importance of coordinating the entire complex of programs in the republic into a single system.

The VUZES, the Secretary of the Party Committee of the Kiev Polytechnical Institute M. K. Rodionov observed, possess a large scientific potential. Almost 1300 doctors and candidates of sciences are working in the Kiev Polytechnical Institute alone. This is a large force both for the training of engineering cadres and for the introduction of scientific developments into production. The Institute's party committee is trying to achieve a more concrete orientation on the part of the departmental party groups, the communists, and the entire faculty toward an intensification of scientific research and toward the active enlistment of students in this important work.

Especially attention is devoted in the VUZ to cooperation with production collectives, and to the joint work of party committees in accelerating the introduction of scientific developments. An economic effect exceeding 30 million rubles and 400-450 author's certificates and patents received by the Institute every year--this is the fruit of the creative cooperation between the VUZ and industrial enterprises. The creation in VUZES of an experimental designing base could do a great deal for the further improvement of scientific work.

Scientific and technological progress in his branch was the topic of the address by the UkSSR Minister of the Coal Industry N. K. Grin'ko. Thanks to a large extent to the expansion of the field of application of mechanized complexes and heading units, and to the introduction of new chipping installations the coal mining plan was fulfilled in the first quarter of this year. More than 130,000 tons of above-plan coal was mined from overall mechanized faces. Important progress in reequipping has also occurred at preparatory operations.

The planned cooperation between the branch and the republic's Academy of Sciences and Ministry of Higher Education, the speaker noted, makes it possible to effectively solve production problems and to raise the technical level of production by means of the introduction of efficient developments. Creative cooperation contracts have become widespread. Last year the ministry's enterprises realized 370 scientific and technical innovations which resulted in the conventional release of 2,500 people.

The speaker pointed to the urgent necessity for the most rapid creation of equipment for the increasingly complex conditions of coal mining. There is a need for machinery on a higher technical level which, above all, is capable of operating without the presence of people. A number of complaints were expressed against scientific collectives.

In his address the First Secretary of the Poltava obkom F. T. Morgun cited examples of practical and concrete relations between the oblast's industrial enterprises and the republic's scientific institutions. He noted that in recent years there has been greater help from scientists for rural workers who have been given new technology, high-yield varieties of agricultural crops, and more productive livestock breeds.

A large place in the speech was devoted to the use on the oblast farms of non-mold board soil cultivation which produces a substantial addition to the harvest, reduces the cost of tractor operations, and decreases fuel expenditures. However, the further introduction of this progressive soil cultivation technology, the speaker said, is being held back by a shortage of special equipment. The attention of scientists toward the mechanization of the production of animal husbandry output also has to be increased.

The UkSSR Minister of Industrial Construction A. N. Shchepetil'nikov characterized the contribution of the organizations of the republic's Ministry of Industrial Construction to increasing and renewing the fixed capital of enterprises and of the most important branches of industry and to reequipping them on a modern technical level. Every year the ministry puts more than 200 large production objects and capacities and 4 million square meters of housing into operation.

The speaker said that the fulfillment of such a large construction program would be inconceivable without the use of the achievements of scientific and technological progress. Thanks to the help of scientific research institutions, there has been an increase in the amount of fully prefabricated construction, an expansion of the production of progressive construction structures and parts

and an increase in their plant readiness, and the mastery of new efficient technological processes. Note was taken of the close creative contacts which have been organized by construction workers with the institutes of the UkSSR Academy of Sciences, the scientific research institutions of Gosstroy USSR and UkSSR, and the republic's Ministry of Higher Education.

The minister provided information on measures aimed at the timely and overall expansion of the production of progressive structures and products. The question of improving the forms and methods of the management of construction production was raised.

The Director of the Institute of Cybernetics imeni V. M. Glushkov of the UkSSR Academy of Sciences, Academician of the UkSSR Academy of Sciences V. S. Mikhalevich devoted his address to the increased effectiveness of the use of computer equipment and automated management systems. The republic, he said, possesses a substantial potential in this field. The first stage of the republic automated system includes the interacting computer centers of UkSSR Gosplan, Central Statistical Administration, and Gossnab, dozens of branch information management complexes, hundreds of enterprise and association automated management systems, and production process automated management systems. During the 10th Five-Year Plan the economic effect from the introduction of the system came to 280 million rubles. Computers and automated management systems have come into machine building and metallurgy, and have helped to automate computation and designing work.

At the same time, the address pointed to substantial possibilities and reserves for increasing the effectiveness of the use of the computer pool, especially in planning, and emphasized the importance of expanding the use of automated managements systems in the food industry, in agriculture, and in trade. There was a discussion of the development, production, and mastery of industrial robots and, first of all, intellectual ones. Economists have to substantiate the places where the automatic equipment will be used.

Modern ships, the Chief Engineer of the Black Sea Shipbuilding Plant Ye. M. Shvets noted in his address, are complex structures whose successful creation requires an overall solution of the problems of increasing the efficiency and technical level of production and of a persistent introduction of the achievements of scientific and technological progress. It is for this reason that shipbuilders are in close collaboration with 50 planning and designing and scientific research institutions. By strengthening production's ties with science, the plant has been doing stable work in fulfilling its state plans for all technical and economic indicators and has been bringing about a substantial increase in production without an increase in the number of workers.

During the 11th Five-Year Plan the engineering services and the entire enterprise collective adopted a course aimed at increasing the scientific achievement introduction rates, and thanks to this, in 1981 the labor intensiveness of output decreased by 1.2 million norm-hours. Our shipbuilders, the speaker said, are counting on the help of science and also of planning and economic agencies in the reequipping of the plant.

The Director of the All-Union Scientific Research and Planning and Designing Institute of the Technology of Electric Machine Building (Khar'kov) V. G. Kostromin emphasized attention to the tasks facing the scientists of branch scientific institutions. He noted that the Institute was performing work according to a finished cycle--from the forecasting and posing of problems to the introduction of finished development work and providing help to plants in mastering new equipment and technology.

In the plans this work has been united into four special-purpose overall programs. As a result of their fulfillment around 150 new machine production processes and more than 300 type-sizes of high productivity equipment have been developed. On this basis it is planned to release 30,000 workers and bring about an increase in productivity in all processes to 2-2.5 times. These programs also provide for the development of metalworking technologies and measures which will make it possible to economize a substantial amount of electrical engineering steel, rolled steel goods, copper, aluminum, tin, and silver.

Comrade V. V. Shcherbitskiy delivered the concluding words at the meeting of the aktiv.

(V. V. Shcherbitskiy's concluding words are published in today's issue of the newspaper.)

The resolution which was adopted mapped out measures aimed at carrying out the decisions of the 26th CPSU Congress and the 26th Congress of the Communist Party of the Ukraine regarding an acceleration of scientific and technological progress and the strengthening of the connections between science and production.

The meeting's participants dispatched a letter to the CPSU Central Committee and to the General Secretary of the CPSU Central Committee and Chairman of the Presidium of the USSR Supreme Soviet Comrade L. I. Brezhnev.

2959

CSO: 1814/102

SCIENTIFIC INTELLIGENTSIA IN SOVIET UNION

Moscow APN DAILY REVIEW in English 3 Sep 82 pp 1-5

[Article by R. Yanovsky, doctor of philosophy: "Scientific Intelligentsia in Soviet Union"]

[Text] The sixty-year-long path covered by the Soviet Union has been marked by a rapid growth of the country's intellectual potential. Today the USSR ranks among the world's leading states in science, technology and culture. Great credit for this should be given to the Soviet multinational scientific intelligentsia.

I.

Science under socialism has become one of the leading factors of social progress since its impact not only on material production but on the evolution of man--the main productive force of society--is becoming ever more tangible. Soviet scientific effort serves the people, the working people, the benefit and progress of mankind, and these aims determine the self-awareness of the scientists, their duty and motives of their activity, which is being linked ever more tightly with the key social problems. The Party and the Soviet people pin big hopes on science and the scientific community.

Socially-oriented, our science (and scientific and technological progress in general) makes it so that the share of Soviet researchers in the accomplishment of large-scale tasks on the improvement of social production and working and living conditions, is constantly growing. Underway are the combining of scientific and technological breakthroughs with the advantages of socialism, and promotion of all the branches of the national economy to the advanced positions, the intensification of economic development, the consolidation of a linkage between science and production. All this is telling evidence of the "social activity" of scientific knowledge and its exclusive possibilities.

It is not only social goals of science that change under socialism, but also the structure of science as a social institution, the system of its organization and development. The efforts of the Party and all Soviet people have brought to life a huge complex of research, designing and design-technological organizations, as well as experimental plants and powerful scientific-production amalgamations. An inalienable part of this complex is academic science.

Major research institutions have been placed closer to the regions of the intensified development of natural resources, to the sites concentrating productive forces. The powerful centers of academic science have been set up in all constituent republics. They are becoming ever more active in the reinforcement of the material and spiritual potential of every republic, in the harmonic development of the entire country.

Quite logically, the very evolution of science's organizational structure sets forth new problems of how to guide it. The blend of social and economic development at the stage of mature socialism demands an ever more thorough coordination of scientific projects and the accelerated utilization of their results.

The primary task in science guidance is to merge science with practice, with production.

Having become a powerful diversified social institution, science in the USSR is increasingly active in tackling the pressing problems of social life, and responding to the needs and requirements of the working people. The lofty humane social objectives of Soviet science offer correct indicators of quest, identify its priorities and bring forth advanced ideas and methods in scientific research.

II.

The social role of science, being realized in the activity of scientists and research teams, is largely determined by the character and peculiarities of the scientific intelligentsia as a specific social group.

The scientific and technological revolution and the objective requirements of socialist society--the development of the economy, education, health care and culture--have stirred up great demand for scientific knowledge causing an unprecedented human injection into the scientific sphere. Over the last 20 years alone the number of scientists, scientific-technical workers, teachers and specialists engaged in research went up from 354,200 to 1,400,000.

What are the distinctive features of the social portrait of today's scientific intelligentsia? The victory of the Great October Revolution, the uprooting of the exploiter classes, the shaping of new social relations and the destruction of socio-economic, cultural, educational and psychological barriers, provided grounds for the appearance of the intellectuals of a new type representing all social groups, above all, people from workers' and peasants' families of all nationalities of the country. Under socialism their positions on all cardinal questions coincide with the interests of the working class, of the entire nation. These traits form the outlines of the social, ideological and ethical portrait of the Soviet scientific intelligentsia.

Distinctive here is its multinational nature. The number of scientists is unswervingly mounting in all constituent republics and the personnel of "big" science is being constantly augmented by representatives of all ethnic groups of the Soviet Union.

Science's cementing link with production, and the mass character being assumed by the profession of a scientist, are factors contributing to the establishment of a classless society. But that is only one side of the process. Production, too, advances toward science in gigantic strides, especially in regard to its main force--man. As Comrade Leonid Brezhnev pointed out at the 26th CPSU Congress, labour by hand and labour by brain are fusing ever more closely in the production activity of millions of factory workers and collective farmers, which also helps obliterate tangible distinctions between the classes and social groups. In other words, creative thinking, which has always been typical of scientific endeavour, has become an imperative necessity for millions of Soviet people, irrespective of their vocational affiliation.

III.

In our days the workers of science are responsible not only for the development of scientific ideas, their introduction in practice, and the growth of the society's spiritual potential. They are also responsible for the destinies of universal peace. Scientists cannot stay indifferent to the shaping of scientific concepts and recommendations facilitating or undermining the establishment of harmonious relations between people and nature. Thus, underway is an ever more organic blending of natural and technical sciences, on the one hand, and the humanities and socio-ethical thought, on the other.

The problem of the scientist's responsibility before society, before the future of mankind, has become particularly acute in our days when the aggressive imperialist quarters are stepping up the arms race and stimulating the evolvment of new murderous types of weapons. More and more scientific workers in the West become conscious of every scientist's personal responsibility for social consequences of his research.

The Soviet scientists are among the most vigorous contributors to the peace campaign against the nuclear arms race, the campaign promoting detente in the aggravated international situation. The scientific workers of this country take an active part in the mass democratic anti-war movements aimed at preventing a nuclear catastrophe; they speak out in defense of peace.

The ability of the Soviet scientist to be equal to his role, to his social responsibility, is inseparably linked with the creative embracing of Marxist-Leninist thought. The efficiency of the scientific intelligentsia's involvement in communist construction directly or indirectly depends on its ideological positions and confidence in the righteousness of our great cause.

One of the key problems of scientific development today is training the younger generation of capable scientific workers. An effective way of upbringing young researchers lies through scientific schools now being set up in all constituent republics. The founders of scientific schools and trends serve for the youth not only as an example in its research activity but also as models from which life is being literally made. Hence special demand on leading scientists, heads of research teams, and not only on their scientific but also public and political activity, on their professional,

social and ethical qualities. The example of the elders helps the youth to make a complicated passage from abstract worship of science to the concrete service to society, the people.

Soviet scientists have always had ample opportunities for serving the society, the people and homeland. In our days these vistas are just boundless. By their creative labour, knowledge and active social work, they add up a major share to the construction of communism.

(PRAVDA, 20 August. Unabridged.)

CSO: 1812/19-E

GURIY MARCHUK ON SCIENTIFIC AND TECHNOLOGICAL COOPERATION

Moscow APN DAILY REVIEW in English 2 Nov 82 pp 1-2

[Article by Guriy Marchuk: "Scientific and Technological Cooperation"]

[Text] The CEMA Committee on Scientific and Technological Cooperation met in Moscow to consider the implementation of general agreements on the development and production of industrial robots and on the promotion and wide uses of microprocessors in the national economies.

These agreements signed by heads of government at the 36th session of CEMA in Budapest in 1982 have opened up a new stage in the technical progress of the CEMA countries. Guriy Marchuk, Vice-Chairman of the USSR Council of Ministers and Chairman of the USSR State Committee for Science and Technology, told a TASS correspondent.

The most impressive scientific and technological problem facing specialists in the CEMA countries is to automate the work of engineering plants, Guriy Marchuk continued. Most of the work force is employed in engineering, which by its very nature is discrete. The production process is rather fast but it requires human attendance and transport handlings which cannot be preprogrammed.

It is robots provided with microprocessors and other control devices that can bring together the discrete cycles of engineering production into a single technological line. Herein lies their revolutionising significance, stressed Guriy Marchuk.

The Committee approved the "concept of technical development of robotics in organising cooperation between the CEMA member-countries in this sphere."

As regards means of computing techniques, above all microprocessors and electronics in the broad sense of the word, it is quite clear that electronics now is invading all spheres of human activity, continued Guriy Marchuk. This is informatics, television and search for data which are needed. This is the use of microprocessors and electronics in organisation and control of production processes and whole big industrial setups. A great deal of work is to be done here. It is necessary now to agree on lines of technical development, unification and standardisation.

The technology of today and tomorrow cannot be conceived without optimum control systems, without the requisite electronic basis, Guriy Marchuk said in conclusion. If we do not agree about these means now, this may slow down the future rates of development of mutual trade. This is why questions of coordinating technical decisions in these spheres--robotics and electronics--are of fundamental importance. They are creating a foundation of future scientific and technological progress.

(Tass, 1 November. In full.)

CSO: 1812/20-E

CEMA SCIENTIFIC-TECHNICAL COOPERATION POLICY REVIEWED

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 7,
Jul 82 pp 2-5

[Article by Guriy Marchuk, deputy chairman of the USSR Council of Ministers, chairman of the USSR State Committee for Science and Technology, and chairman of the CEMA Committee for Cooperation in Scientific and Technical Research: "Cooperation among CEMA Member Countries and its Role in Accelerating Scientific and Technical Progress"]

[Text] The acceleration of scientific and technical progress naturally is regarded by the socialist countries as one of the principal tasks of the present and the basic means of intensifying public production. The decisive significance of science and technology in the development of each country, especially in the integration measures it puts into effect, substantially broadens the limits and amount of international cooperation and makes possible its transformation into an effective tool of coordinated scientific and technical policy.

The 26th CPSU Congress and the congresses of the communist and workers parties of other CEMA member countries have unanimously reaffirmed the necessity of extending the international socialist division of labor, of improving the forms and methods of interaction in different sectors of production, science and technology, and of developing economic integration. "The CPSU and other fraternal parties," Comrade L. I. Brezhnev said at the 26th CPSU Congress, "are taking a course to turn the forthcoming two five-year plans into a period of intensive production and scientific and technical cooperation among the countries of socialism."

In the current stage, combined research operations are contributing to the active inclusion of CEMA member countries in a system of international socialist division of labor, thereby fulfilling a qualitatively new role. Under the conditions of the scientific and technical revolution, more and more significance is being assumed by those directions of collaboration linked with overall solution of cardinal problems. These are improvement in the technical and economic indicators of production being turned out, as well as development of progressive manufacturing methods, creation of new forms of articles, instruments and apparatus, and organization of highly efficient production facilities.

Accelerated development of scientific and technical progress requires continuing improvement in cooperation among CEMA member countries. At the 35th meeting of the CEMA Session, the task of raising this work to a qualitatively new level, primarily to orient it more purposefully toward intensification of production, was undertaken. The specific contribution of science and technology in this process, it was pointed out at the session, must become one of the basic criteria in evaluating the results of cooperation.

However, it should be admitted that to date it still has not become a decisive factor in production intensification. In order to radically change this situation, a combination of problems linked with economic, organizational and legal relations must be worked out and consistently resolved. This will make it possible to ensure the dynamic growth and rational interaction of the scientific and technical potentials of CEMA member countries and to more efficiently utilize the latest achievements in individual countries and on the scale of the entire socialist community.

The transition from the extensive way of development to the intensive puts in the forefront the problem of increasing the effectiveness of cooperation and the intensification of all scientific research activity.

Today the necessity of concentrating interaction in decisive directions is perceived more and more clearly. Such an orientation will be conducive to more efficient use of the resources available in the countries and achievement of world level in the production sectors most important for technical progress. This is why selection of the directions directly linked with its acceleration is becoming the key problem at the present stage.

Meanwhile, experience demonstrates that a scientific and technical policy that proceeds from the fundamental tasks of economic development is far from always developed in the course of bilateral and multilateral consultations. Frequently, after familiarizing each other with the basic directions of work in the field of science and technology, countries continue to duplicate their partners and orient themselves toward subject matter that has already been implemented. Cooperation thereby is reduced to the simplest forms: the exchange of information and mutual consultations.

Often the sides embark upon joint research without sufficient justification and an accounting of their own real potentialities.

In this regard, the recommendation to CEMA member countries contained in the decisions of the CEMA Session (35th meeting) to develop priority directions of scientific and technical progress in key sectors of the economy is of considerable importance.

Among the primary tasks of cooperation a vital place, in our view, should be held by problems related to the further progress of science-utilizing [naukoemkiye] sectors. Under the conditions of the scientific and technical revolution, improvement in the efficiency of public production is determined

to a greater and greater extent by the progress of these very sectors. They lead both in the saturation of skilled personnel and in the proportion of funds allocated for scientific research and experimental design operations. Among such sectors are, for example, the chemical, electrical engineering, radio electronic, instrument building, and aircraft and motor vehicle industries. The key role of these sectors, and especially machine building, in scientific and technical progress remains indisputable.

This was reflected in the decisions of the CEMA Session (34th meeting) and its Executive Committee (97th meeting), which defined seven groups of machinery and equipment for which high specialization and joint cooperation are specified for their development and production.

The Council Session (35th meeting) charged the CEMA Committee for Cooperation in Scientific and Technical Research, with the participation of the CEMA Permanent Commission for Radio and Electronics Industry (PK REP), the Intergovernmental Commission for Collaboration among Socialist Countries in Computer Technology Mezhpravitel'stvennaya komissiya po sotrudnichestvu sotsialisticheskikh stran v oblasti vychislitel'noy tekhniki (MPK po VT) and other organs of CEMA and international economic organizations of CEMA member countries, with developing a draft program for collaboration in the development and broad utilization in the national economy of CEMA member countries of microprocessor technology in the 1982-1990 period, which was approved at the 25th meeting of the CEMA Committee for Cooperation in Scientific and Technical Research.

The program is overall in nature and includes measures throughout the entire cycle of science-technology-production-sale. Its objective is implementation of a unified strategy to improve the basic sectors of the national economy on the basis of built-in microprocessor systems.

The necessity for collaboration on the problem cited was dictated by the objective course of technical progress and economic development of our countries.

Wide use of microprocessor technology will lead to profound economic, social and technical changes related to an increase in labor productivity and product quality, reduction of the costs of labor, fuel and power, material resources, and manual and unskilled labor, and to stimulation of the process of training and automation of the processes of developing and planning new equipment.

To put the program into effect, a plan of general agreement on multilateral cooperation for the development and wide use of microprocessor technology in the national economy of CEMA member countries was prepared and approved at the 26th (special) meeting of the CEMA Committee for Cooperation in Scientific and Technical Research.

A plan of a unified concept for developing robot building in CEMA member countries also has been coordinated. This concept assumes standardization of the basic components of industrial robots and robotized industrial

complexes, including the modular principle of building the means of robot technology. At the 26th meeting of the Committee, a plan of general agreement on multilateral collaboration was approved for the development and organization of specialized and subcontracted production of industrial robots.

Putting the program stipulated by the general agreement into effect will make it possible to shift to a new level of production organization in machine building and other sectors of industrial production. The use of robots will lead to new quality in organizing production on the basis of continuous, flexibly rebuilt automated production lines, using highly efficient equipment controlled with the aid of microprocessor technology. This will make it possible to more efficiently utilize labor resources at a time when they are becoming increasingly scarce; to eliminate the use of unskilled and monotonous labor, especially under difficult and unhealthy conditions; to improve the work shift system of basic industrial equipment; and to shift to the establishment of fully automated sections and shops and automatic plants.

The general agreements on microprocessors and industrial robots were signed in the course of the 36th meeting of the CEMA Session.

Another important direction is solution of the fuel and power and raw material problems. The gap existing today between the rates of consumption of natural resources and their extraction requires acceleration in the research, development, and especially the mass production of new machinery capable of recovering these resources from deeper and more remote natural sources.

Solution of the fuel and raw material problem which, as is well known, constitutes one of the most important tasks of socialist economic integration, presupposes in particular the consolidation of efforts by CEMA member countries in developing available resources. Such a combined operation can be effective only by using the most advanced machinery and equipment, the means of storage and transportation of raw material and semimanufactures, and the transmission of power over long distances.

Meanwhile, the countries have far from the full range of machines and equipment available, and those being turned out today often fall short of the best world models. This is why establishment of new technology for the extraction, processing and concentration of raw material and power resources, as well as efficient means to transport them, is one of the chief prerequisites for successful solution of the fuel and raw material problem and the most important tasks which confront the countries in the process of collaboration.

The problems related to the development and assimilation of new forms of raw material and materials, primarily synthetic ones, are no less significant.

Taking this into account, the Program for Scientific and Technical Cooperation of CEMA Member Countries to Resolve Fuel and Power Problems in the 1981-1985 Period and for the Long Term (up to 1990) was developed by the

CEMA Committee for Cooperation in Scientific and Technical Research based on the countries' materials and the organs of the Council. In order to study opportunities for organizing collaboration in introducing new technical solutions which provide for a significant increase in the extent to which renewable sources of energy are utilized, proposals for the development of over 60 installations and units which convert solar, geothermal and wind power have been directed to the appropriate CEMA organs and international organizations.

The unproductive and often impractical use of natural resources has to a significant extent been the result of the application of obsolete tools of labor. For this reason, defining the problems related to the creation and introduction of fundamentally new tools of labor should also be among the priority directions of scientific and technical collaboration, in our view. This means that research must be aimed at substantial improvement in the productivity of new machines, a sharp reduction in their weight, dimensions, and accordingly their materials-intensiveness, and a substantial reduction in the amount of energy consumed by them. In order to achieve this, an overall approach to the technical retooling of the appropriate sectors of the national economy is necessary. In other words, solution of scientific and technical problems should be closely linked with the entire process of expanded reproduction.

As experience shows, the development and introduction of new technology which will ensure a rise in the quality indicators of output produced are becoming the most important prerequisites today for extension of integration processes in the field of production and turnover. This direction of interaction in the field of science and technology also is of considerable economic and political importance because it contributes to a solution of the task of equalizing the levels of economic development of CEMA member countries stipulated in the Overall Program. From this follow new, increased requirements for collaboration in the field of technology: high quality of planning, purposeful specialization and joint cooperation in the design and preparation of manufacturing lines. An important place is held here by the problems related to processing methods which ensure a sharp reduction in the energy- and materials-intensiveness of production, as well as the development of new technology which will substantially reduce the outlay of materials per unit of finished products and will provide for the complete use of raw material in the future without waste.

In speaking about the basic directions in improving the forms and methods of scientific and technical ties among the CEMA member countries under current conditions, the following should be singled out first of all, in our opinion:

consolidation of planning bases and improvement in the organization of collaboration, broad application of contract forms;

adoption of an overall approach in planning and organizing measures;

an increase in the role of programs designed for the long term, an increase in their time horizon [vremennoy gorizont], an increase in the role of forecasts of scientific and technical development;

an increase in the role of multilateral collaboration; and

expansion of direct links among ministries, departments, associations and organizations responsible for developing and putting into effect scientific and technical policy in the countries.

Improvement in interaction, in our view, should proceed on the path of applying the principles of "multiple" [skvozhnoye] planning, that is, drawing up programs of collaboration for all links in the science-technology-production-sale cycle on the broadest possible scale. This requires a significant increase in the responsibility of those who are directly executing, and a more clear-cut definition of their role and duties in the process of carrying out the programs agreed upon.

The decisions of the CEMA Session (35th meeting) pointed to the necessity of precisely stating these duties in agreements (contracts) and the responsibility not only for carrying out the programs of scientific and technical cooperation, but for the timely assimilation of all innovations in production as well. It was recommended that the appropriate conditions and prerequisites for the broad application of such forms of interaction be established in the countries.

At present, CEMA member countries are moving to work out the problems outlined on a contract basis.

Depending on their nature and importance for the national economy, it is advisable to conclude agreements on the appropriate level, including general agreements at the level of the governments of the CEMA member countries concerned.

It is advisable in these agreements to define the duties of the sides for overall solution of scientific and technical, production and economic, and trade problems; to regulate legal, financial, and patent and license relations which emerge in the course of collaboration, including questions of price formation for mutually supplied output and scientific and technical results. In the process, it is necessary that conclusion of an intergovernmental or interdepartmental agreement be preceded by technical and economic substantiation.

One more important problem, which as previously remains a bottleneck in the science-technology-production-sale cycle, is the practical utilization of the results of research and development.

The fact is that, despite drastic measures taken in CEMA member countries, the plans for developing science and technology are still not always organically coordinated with other sections of national economic plans, particularly for capital construction. Meanwhile, if appropriate funds are not

provided for in advance, if the necessary production capacities have not been prepared, if specific measures for scientific and technical and production and economic collaboration have not been agreed upon, this has an effect in the final analysis on the effectiveness of the practical utilization of results obtained in the course of implementing the agreements.

Until now this process has not become a subject of division of labor and cooperation in multilateral relations of the CEMA member countries. For this reason, in our view, it is today legitimate to put forward the question of forming a new, sufficiently independent area of collaboration: joint introduction of the results of scientific research in production. With such an approach a real opportunity emerges for the joint construction of new production capacities and the rebuilding of existing ones, and the coordination of capital investments, the allocation of which for one or several countries practically always has been attended by difficulties.

In agreements and contracts, the expected results of applying technical innovations must be planned. In this regard, it appears advisable to introduce special accountability on the assimilation in production in the periods of time and in accordance with the methods established by the CEMA Committee for Cooperation in Scientific and Technical Research.

It should follow, in our opinion, to also reinforce the coordinating role and expand the rights of CEMA organs for closer coordination and overall solution of scientific and technical collaboration matters, including operational control for its introduction.

CEMA permanent commissions, whose participation in implementing plans for scientific and technical collaboration, and first of all in assimilating its results in production, has been manifestly inadequate to date, have been called upon to play a special role here.

It is necessary to more practically provide for the interaction of these commissions, to study the positive experience of bilateral contracts and to utilize and expand it in every possible way, and to eliminate duplication in operations and problems resolved on a bilateral and multilateral basis.

Improvement of the economic incentive mechanism also is needed. This is necessitated by the fact that estimates of efficiency in working out scientific research subjects in accordance with a line of international cooperation have still not become an effective tool in determining their priority. The economic levers and incentives which are adequately developed in the countries themselves are not being practically adapted within the framework of agreements.

The interests of each side must be more specifically and definitely recorded in agreements and contracts. In a number of cases, it is not enough that partners express just a general interest in one subject or another without indicating their own specific contribution to scientific research, and the proportion of their participation in the practical assimilation of an

experimental series and in the output of an industrial series, and in the deliveries of finished products.

In the stage of preparing agreements or contracts for scientific and technical cooperation it is important to determine the base, funds and personnel that the partners have at their disposal for a given subject. In accordance with this, in our view, the amount of work must also be assigned.

One would think that information of this type should become an integral constituent part of technical and economic justifications which are worked out by the countries before the conclusion of corresponding agreements or contracts. This means that the problem of economic incentive presupposes a harmonious system of measures which apply to all stages of the science-technology-production-sale cycle.

Solution of these tasks will make it possible to raise our collaboration to a new stage, to extend integration ties, and thereby promote acceleration of the rates of economic and social development of the CEMA member countries.

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UZBEKISTAN SCIENTISTS GREET 60TH ANNIVERSARY OF USSR

Tashkent OBSHCHESTVENNIYE NAUKI V UZBEKISTANE in Russian No 6, Jun 82 pp 3-9

[Article by I. I. Iskanderov: "Scientists of the UzSSR Academy of Sciences Greet the 60th Anniversary of the USSR"]

[Text] Just like the entire Soviet nation, the toilers of Uzbekistan are welcoming an important anniversary--the 60th birthday of the USSR--with new achievements in all sectors of communist construction. A high assessment of the successes of our republic in economic and cultural construction was given by the General Secretary of the CPSU Central Committee, Chairman of the Presidium of the Supreme Soviet of the USSR L. I. Brezhnev during his stay in Tashkent in March 1982.

The republic's scientific personnel--and L. I. Brezhnev indicated this directly--have made a large contribution to these accomplishments. It is gratifying to note also that from the rostrum of the 26th CPSU Congress, the President of the USSR Academy of Sciences, academician A. P. Aleksandrov gave a lofty assessment of the effectiveness of the search of the Uzbekistan scientists to discover new kinds of cotton plants, develop economic irrigation norms, create harmless defoliants, substantially broaden the use of cotton by-products, and he emphasized the important role of the republic's successes in the production of medicines.

This has been achieved thanks to the constant attention and the genuinely fatherly concern of the CPSU and the Soviet government for the development of science.

The collectives of the scientific institutions of the Uzbekistan SSR Academy of Sciences are also constantly making this enormous concern felt.

At the 20th Congress of the CP Uz [Communist Party of Uzbekistan], candidate-member of the CPSU Central Committee Politburo, first secretary of the CP Uz Central Committee Sh. R. Rashidov highly rated the scientific achievements of the UzSSR Academy of Sciences. "In light of qualitatively new requirements facing the scientists of the republic," he said, "the role of the UzSSR Academy of Sciences is growing even more. The Central Committee of the Uzbekistan Communist Party highly values its activities which are all the more fully linked with the requirements of communist construction. We will also in the future show constant concern for the growth of the Academy of Sciences as the highest and leading over-all scientific organization of the republic, called to make a substantial contribution to the development of Soviet science and the speeding up of scientific and technical progress."

Some 16,000 staff members, including 1,600 candidates and 250 doctors of science, are now working in the republic's Academy of Sciences network. During the past year alone, 185 results of research conducted by them have been introduced into the national economy as opposed to 66 in 1976, and the total economic impact from their implementation increased during the past five years from 314 to 670 million rubles. Each ruble invested in science gave a return on the order of 5 rubles and 73 kopecks in 1981 as opposed to 5 rubles and 10 kopecks in 1976.

The role of science in solving large agricultural problems and, primarily, in developing cotton-growing and increasing the effectiveness of the entire national economic cotton complex of the republic ought to be especially stressed. New cotton plant varieties (Tashkent-6, Samarkand-3, Ok-Oltin) have been raised and acclimatized to large areas, the Tashkent-8 variety has been passed on for state grading, and a new hybrid has been obtained by crossing a Mexican type with the Ekspress-2 variety. The earlier acclimatized AN-402, AN-Uzbekistan-3, AN-Samarkand-2 and others are yielding good harvests.

Our scientists have developed an agricultural system and a complex of agricultural methods for cultivating new varieties. The technology of sowing cotton plants along ridges and crests is in view. Its introduction will permit an increase in productivity of 4-6 quintals per hectare.

Fertilizers containing trace elements as well as methods for stimulating the growth of seeds with an A-1 polymer compound are being widely used in agriculture. The production of ammophos containing copper and zinc elements is growing.

The use of uncovered standardized seeds is being widened in cotton growing. Their use will permit a decrease in the seed expenditure norm for sowing from 65 to 22 kilograms per hectare and will realize a 170 ruble savings per hectare.

The completion of production tests on the use of cotton plant stalks for cattle feed will become an important contribution in putting into effect the USSR food program which was worked out by the party and approved by the May (1982) plenum of the CPSU Central Committee. Some 10,000 tons of silage from fermented guza-paya have already been laid in, and it is expected that there will be a 50-60 kilogram increase in the weight of cattle per each ton of feeding. The successful use of chlorella is continuing in cattle-raising, silkworm breeding, and poultry farming. Each ton of it provides 3.5 kilograms of cattle weight increase and from each box of silkworm eggs an additional 13 kilograms of cocoons are obtained. Annually 590,000 tons of chlorella are produced within the UzSSR Minsel'khos/Ministry of Agriculture network alone.

Work connected with the social program is being broadened. Substantial results have been obtained in the creation of new medicinal preparations. Gossypol liniment is being used in the public health system to treat some skin diseases. Pharmacological gossypol has been manufactured and six new compounds based on it have been obtained. Some 120 new medicinal compounds have been obtained from 160 plants of local flora which have been studied and these have been turned over for pharmacological testing. Mechanisms and factors for the emergence of sugar diabetes have been established, and recommendations for its diagnosis and treatment have been prepared.

Research is being successfully carried out on the problem of broadening the mineral and raw material base of the national economy of the republic. New ore deposits and a new industrial type cement raw material have been uncovered. Work on increasing the effectiveness of using secondary resources has been continued.

Trends involved with broadening the production of new materials are being developed. The use of gold and iodine isotopes for the early diagnosis of oncological diseases is being expanded. A significant impact has been obtained from the use in industry of the technology of laser roasting of semiconductors, phototransformers, and the processing of refractory metals on electric spark installations. Tests on the bacterial leaching of gold from flotation concentrates have been successfully completed. The possibility of the directed growth of monocrystals in a laser radiation field has been proven. The use of new varied-purpose devices, created in the design bureaus of the Academy, has great importance in electronic engineering, instrument building, and the metallurgical industry.

The results of the work of seismologists have great importance in increasing the effectiveness of capital construction. Seismic microregionalization was accomplished in the design of the Tupolangskiy reservoir. A forecast of six strong repeated shocks of the Nazarbekskiy earthquake was made, and recommendations on building the epicentric and adjacent areas of a settlement have been prepared. Work on developing a theory of seismic stability of complex networks for underground structures has been continued. The ground pressure in a tunnel has been determined and a method of accounting for the casings of rectangular cross-section tunnels has been worked out.

In the sphere of putting management improvement programs into effect, work is being conducted on the creation of a republic ASU/automated control system/, the first section of which is already functioning. In 1981, a territorial ASU of the Samarkand Oblast was put into operation. A system for processing information of gas industries, permitting the optimization of the number of wells, was introduced in Turkmeniya.

Special note should be made of large operations such as the total program of scientific and technical progress and its socioeconomic consequences executed in accordance with the decree of the CPSU Central Committee and the USSR Council of Ministers of 12 July 1979 "Improving the Planning and Strengthening the Influence of the Economic Mechanism on Increasing the Effectiveness of Production and Work Quality," as well as the working up of plans for the socioeconomic development of Tashkent, accomplished on the initiative and under the leadership of the Tashkent city party committee. Some 15 institutes of the Academy of Sciences, many ministries, departments, enterprises and city organizations are participating in it.

The singleminded work of the Institute of Economics on assessing the effectiveness of scientific research and experimental design operations of the Academy of Sciences deserves serious attention.

The contribution of the Academy to the ideological maintenance of party plans is substantial. The connection of research with the economic, sociopolitical and spiritual development of the republic is becoming closer. The problems of social development and the increase in the culture of the villages of Uzbekistan during the period of mature socialism are being worked out and a comparative analysis of the development of the state system and the laws of the union republics is being conducted.

In connection with the coming 2,000-year anniversary of the city, work on the history of Tashkent and the study of cultural, revolutionary and combat glory monuments is being continued. The section of the Tashkent Oblast compilation of historical and cultural monuments of the UkSSR has been completed. Our orientalists, linguists, literature specialists and others are conducting timely research.

The scientists of the Karakalpakskiy affiliate of the UkSSR Academy of Sciences are performing research on increasing the fertility of natural pasture, the effective utilization and protection of the plant and animal world, the development and disposition of the productive forces, and the study of the history of the Karakalpak people, their language and literature. A four-volume dictionary of the Karakalpak language has been completed.

In the publication of scientific transactions an important place belongs to the UzSSR publishing house "Fan" which issued about 80 monographs in 1981 including the fourth volume of "Irrigation of Uzbekistan," a new edition of the "Atlas of the Starry Sky," "Yana Geveliya," "Alkaloids," "Economic Problems of Developing and Implementing an Over-All Program," "Cotton," etc.

The Academy of Sciences has become a center for conducting many all-union and republic forums on the urgent problems of modern science. In 1981 alone, 22 such programs were conducted, including all-union conferences on chromatographic analysis, improving arid zone pastures, problems of dialectics, general and specific, in developing a mature socialism, and others.

The achievements of the UzSSR Academy of Sciences have been exhibited at the international exhibition and trade fair in Turkey, during the work of the 38th session of the Council on the Coordination of Scientific Activities of the academies of science of the union republics, at the USSR VDNKh, etc.

The successes which have been achieved are significantly being determined by the improvement of the planning of scientific research on the basis of a programmed-goal approach. If during the 10th Five-Year Plan the Academy participated in the fulfillment of 23 all-union and 13 republic programs, then in 1981--it realized 29 all-union and 21 republic scientific and technical programs.

An over-all reorganization of the plan of scientific research work has been accomplished. For the first time more than 40 percent of scientific topics are being fulfilled on the tasks for GKNT/State Committee of the USSR Council of Ministers for Science and Technology, the presidium of the USSR Academy of Sciences, and others. Additionally, the relative share of contract economic research reached 20 percent of the total volume of costs compared with 14 percent in the 10th Five-Year Plan.

The coordination of work both within the Academy as well as with the VUZ's and the industrial scientific research and design institutes is being developed. The recently-created republic council on the coordination of scientific research work has been called upon to play a large role in this.

Special attention is being paid to improving the procedures for research management. Ties with the academies of science of the fraternal republics of Central Asia and Kazakhstan are being strengthened. In 1979, for example, in accordance with a unified plan, 26 institutions of the UzSSR Academy of Sciences and 19 of the TaSSR Academy of Sciences carried out research on 42 subjects. The problems of mastering the deserts and mountainous territories, earthquakeproof construction, the over-all "Cotton" program, and a number of others are being jointly worked out.

Research carried out on the basis of creative cooperation agreements is receiving wide dissemination. There are now 223 of them. Research is now being successfully conducted in accordance with agreements with the USSR Ministry of the Chemical Industry, the republic ministries of light, cotton-cleaning, and food industries, the Tashkent Aircraft Association imeni V. P. Chkalov, etc.

The network of industrial laboratories has been enlarged to eight. An experimental base is being developed. Now seven design organizations and two experimental enterprises are in operation and the production of radioactive compounds, which are also going into a number of CEMA countries, is being expanded. Phianite crystals, used in the jewelry industry, are much in demand in our country and abroad.

Agreements made between the Academy and local party organs have become customary. Thus, an agreement was concluded with the Tashkent Oblast party committee by which the Tashkent scientific center was recently created. Similar work is being carried out with the Samarkand CPUz obkom.

Great attention is being paid to questions of training scientific personnel and increasing their ideological and political level. During the year, 28 doctoral and 180 candidate dissertations were defended by staff members of the UzSSR Academy of Sciences. Some 30 specialized councils for 56 professions are functioning in 23 institutions of the UzSSR Academy of Sciences. During the year, 18 doctoral and 234 candidate dissertations were defended in them. Constant attention is also being paid to the certification of scientific personnel.

In accordance with the results of the 10th Five-Year Plan, 76 of our staff members have been awarded high governmental decorations and honorary titles. The title of prize winner of the USSR state prize for science and technology was awarded in 1981 to two persons, and the prize winner of the UzSSR state prize imeni Beruni for science and technology was given to 17 individuals.

Scientific-organizational work has been strengthened. The practice of developing and implementing scientific research work plans and socialist obligations is being made better, and the control and inspection of the execution of decisions which have been made are being improved. Work on increasing the level of state and planning discipline is being strengthened. From these positions the activities of scientific institutions, subunits, and each staff member are now being assessed. To increase the effectiveness of control, a special group, under a president, was created to check and control execution.

Ties with ministries and departments, enterprises and organizations, are being strengthened. A number of out-of-town meetings, held jointly with oblast party committees, have been conducted--interdepartmental conferences in Andizhan, devoted to the problems of using future kinds of cotton plants in the Fergana valley and the seismicity of the territory of the Andizhan Oblast; a meeting in Nukus which examined the prospects for the development of the mineral and raw material resources of the KK/Karakalpak/ ASSR; meetings in Samarkand and the Tashkent Oblast, which discussed the prospects for the over-all research of cattle-breeding type institutes.

The USSR Academy of Sciences has intensified assistance to our academy. The 38th session of the Coordinating Council of the USSR Academy of Sciences, which took place in May of last year, was a great event. Attended by presidents of the academies of all the union republics, it selected the paths for developing science and strengthening the coordination of research. A group of prominent physicists under the leadership of academician A. A. Prokhorov familiarized themselves with the work of the physical institutes of Uzbekistan.

Measures have been taken to increase the effectiveness of research, concentrate energies on the major scientific trends, and regulate the Academy's structure and staff. The Department of Polymer Chemistry was elevated to the Institute of Polymer Chemistry and Physics. The Uzbek Scientific Research Institute of Power and Automation was accepted into the UzSSR Academy of Sciences system.

Work is being carried out to improve the management and strengthen the material and technical base of research. Material and financial resources are being used more effectively. The construction of the buildings of the TsPKTB NP/the central planning, design and technological office of the petroleum industry/ with machine shops, an institute of mathematics, a latitudinal station in Kitab, and a main library has been completed. Six million rubles worth of instruments and equipment have been acquired through Tsentrakademsnaab/Central Supply Administration of the Academy of Sciences, USSR/.

The management of inventive activities is being improved. The volume of patent services is being widened.

The international ties of the UzSSR Academy of Sciences, first of all with the scientists of the CEMA member countries, are becoming stronger. During the past year, 22 conferences were held with foreign scientists participating. The Academy during this time received 129 delegations, containing 423 foreign scientists, and 55 of our scientists went on foreign scientific TDY's.

The socialist competition of the collectives of the institutions and organizations of the Academy of Sciences, which spread in honor of the 60th anniversary of the formation of the USSR, plays an important role in increasing the effectiveness of research. For success in developing science, in accordance with the results of socialist competition, the Institute of Geology and Geophysics imeni Kh. M. Abdullayev was awarded the challenge red banner of the CPUz Central Committee, the UzSSR Council of Ministers, the Uzsovprom/Uzbekistan trade union council/, and the LKSMUZ/Uzbekistan Komsomol/; the challenge red banner of the presidium of the USSR Academy of Sciences and first prize were awarded to the Institute of Experimental Biology of Plants, second prize--Institute of Economics, certificates of the AUCCTU and GKNT--to the NPO/scientific production association/ "Kibernetika," the international prize of the Novosti news agency imeni Abu Ali ibn Siny (Abyssinia)--the Institute of Oriental Studies, the diploma of the presidium of the Supreme Soviet of the UkSSR--the Kitab International Latitudinal Station imeni Ulugbek, the challenge red banner and diploma of the presidium of the UzSSR Academy of Sciences and the republic committee of the trade union of educational, university, and scientific institution workers--the NPO "Kibernetika," etc.

However, we cannot be content with what has been achieved. The most crucial tasks, resulting from the resolutions of the 26th CPSU Congress, the 20th CPUz Congress, and subsequent plenums of the CPSU and CPUz Central Committees, are facing us. Their realization requires a further improvement in the planning of all research work based on the selection of future scientific trends tied to the requirements of the national economy and the establishment of the optimum correlation of fundamental and applied research.

It is necessary to increase the volume and raise the tempo of fulfilling economic contractual research, the ratio of which is at present 1.5 times lower than the set level. This work must be provided with the appropriate material and technical resources, staffs, and wage fund. Apparently, the necessity for centralizing the planning of economic contractual research in the person of a single customer--the republic Gosplan--has grown.

Less than 60 percent of the completed scientific and technical developments are in use at present in the national economy. The proportion of work which is yielding insignificant improvements and which is narrow in profile and with a small economic impact is great.

In light of the resolutions of the May (1982) CPSU Central Committee plenum, the working out of the problems connected with the implementation of the food program ought to be strengthened sharply.

It is also necessary to increase the tempo for introducing work into the cotton complex field. The experimental base requires significant broadening.

The problem of training highly-qualified scientific personnel, especially doctors of science for technical, physico-mathematical, chemical, and agricultural sciences is still acute. It is necessary to more effectively utilize graduate study and to increase the role of the institute of research trainees, looking upon it as the main channel for reinforcing graduate study. There are also deficiencies in certifying personnel and in the operation of a number of specialized councils.

It is necessary to raise the tempo for acquiring capital investments and construction installation work, to improve the material and technical supply system, and to strengthen financial and staff budget discipline even more.

But this is the main thing--it is necessary, as pointed out at the 26th CPSU Congress, to concentrate our efforts "on the solution of the key national economic problems and on discoveries capable of introducing really revolutionary reforms into production."

In the circumstances of our republic the following things are moving forward in the first plan: the development and implementation of a food program, a program for optimizing the development of a national economic cotton complex, the formation of territorial production complexes, regional problems with the economic and social development of small cities and villages, consumer goods production, the movement into the region of part of the flow of Siberian rivers, the use of solar energy, the development of powder metallurgy, composite polymeric materials, and the solution of other pressing problems, answering the tasks for the steady

development of the economic system of Uzbekistan and increasing its role in the unified national economic complex of the country. The importance of these problems is growing still greater in light of the resolutions of the May (1982) plenum of the CPSU Central Committee, the positions expressed by the General Secretary of the CPSU Central Committee, Chairman of the Presidium of the USSR Supreme Soviet L. I. Brezhnev during his stay in Tashkent, the appeals of the CPUz Central Committee, the presidium of the UzSSR Supreme Soviet, the UzSSR Council of Ministers to all workers of the republic, the resolutions of the recently-held CPUz Central Committee plenum. To implement them we have worked out a complex of measures to broaden theoretical and applied research along the main trends in the natural and social sciences, especially in the area of developing cotton-growing and the industries of the cotton complex, the realization of the food program, for water, power fuel, and mineral and raw material resources, new power sources, labor resources, the formation and growth of territorial production complexes, the creation of an automated national economic management system, and the acceleration of the introduction into it of scientific and technical developments. We have to concentrate scientific energies and material resources on these trends.

Now the scientists of the UzSSR Academy of Sciences are devising 234 tasks for 29 all-union and 21 republic scientific and technical programs. Besides that, research is being conducted on 367 subjects in the field of the natural and social sciences. This work is being carried out from a programmed-goal approach, a strengthening of the ties of science with practical work, and an increase in the quality and effectiveness of research.

There is no doubt that the 16,000-member collective of the scientists of the UzSSR Academy of Sciences, under the leadership of the republic party organization, carrying out the historic resolutions of the 26th CPSU Congress, the 20th CPUz Congress, the subsequent plenums of the CPSU and CPUz Central Committees, the directives contained in the speeches of L. I. Brezhnev and included in the national socialist competition, will fittingly greet the 60th anniversary of the formation of the USSR with new scientific achievements contributing to the successful resolution of the immense tasks of the construction of communism in our country.

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COLLECTIVE USE OF SCIENTIFIC EQUIPMENT

Kishinev KOMMUNIST MOLDAVII in Russian No 7, Jul 82 pp 80-83

[Article by D. Gitsu, chief scientific secretary of the Presidium of the MSSR Academy of Sciences and corresponding member of the MSSR Academy of Sciences, and Z. Zelikovskiy, director of the TsAM of the MSSR Academy of Sciences and Candidate of Technical Sciences: "The More Effective Utilization of a Scientific-Experimental Base"]

[Text] The 26th CPSU Congress determined that the growth of science and technology must be subordinated even more to solving the economic and social problems of Soviet society, speeding up the intensification of the economic system, and increasing the effectiveness of public production. This requires an acceleration of scientific and technical progress which is connected with increasing expenditures on the development of science and technology and introducing their results into production.

At the present time the growth rate of these expenditures exceeds the national income growth rate. However, the human resources and the material and technical means which society can allot to the development of science and the creation of its material and technical base are limited. Therefore, a great deal of attention is being paid in the country to increasing the effectiveness of scientific research, improving the intensive forms of its development, and industrializing science.

It should be noted that the possibilities of modern science are being determined to an ever greater degree by the technical means available to scientists, the presence of a first-class research base, equipment, and the level of automation of scientific research. This is explained by the fact that in the post-war years the costs of creating a scientific material and technical base are growing more rapidly than the costs for scientific worker wages.

So long as this tendency remains in the future, it is clear what great importance the problem of the efficient use of scientific equipment has. The ways to solve it are set out in the decree of the CPSU Central Committee and the USSR Council of Ministers "Strengthening Work on the Economic System and the Efficient Utilization of Raw Material, Energy-Producing Fuel, and Other Material Resources."

The planned start of the economic system of our state and the principles of scientific research planning, especially the programmed-goal method which is now accepted and developed, permit, to a significant extent, the optimization of the effectiveness of the activities of scientific institutions on the whole as well as the use of a scientific experimental base. More progressive organizational forms are required for this. The centers for the collective use of scientific equipment and the cooperation in operating them is one of the forms which is receiving an ever wider dissemination.

The present trend is also being developed in our republic's Academy of Sciences. An analysis conducted five years ago of the experimental and technical equipment of laboratories and services demonstrated the unsatisfactory condition of this most important business. Although individual scientific subunits tried to provide tools and to organize cooperation in using scientific equipment, a low capital-labor ratio (it was half of the average indicator for the country) and the dispersal of tool equipment and the means to acquire it were typical, on the whole, for the Academy. There have been large unproductive expenditures of scientific worker time, many types of equipment have been inaccessible to a wide circle of scientists, and the automation of scientific research and metrology was in unsatisfactory condition.

All of this has caused the low use of scientific experimental base capacity. It was practically impossible under such conditions to quickly increase the quality and resultancy of science, the effective implementation of transferring to a programmed-goal method of planning, and the fulfillment of the role of scientific research coordinator.

Work is now being conducted on creating and introducing three long-term, interdependent programs of general academic organizational and technical collective use systems: computer, scientific equipment with automated tool-oriented complexes, and the metrologic provision of a scientific experiment with a centralized stock of measurement devices. They are carried out by TsAM/Center for the Automation of Scientific Research and Metrology/ jointly with other institutions of the Academy under the leadership of the Council for Scientific Instrument Building and the Automation of Scientific Research attached to the Presidium of the MSSR Academy of Sciences.

A characteristic feature of these systems is the combination of their creation and operation stages, the continuity and naturalness of the conversion from individual to collective usage, the variety of forms and types of services, the different degree of equipment centralization. With such an organization the academy's interests on the whole are harmonized with the interests of the institutes and each scientist under the motto "For the Academy the Use of Equipment is Collective, and for the Scientist--Individual."

At the present time more than half of the scientific equipment is included in collective usage systems. Great attention is being paid to the creation of conditions for the operation of subunits entering these systems. Thus, their existing areas have been renovated and the construction of new spaces for them has been completed, and placing such subunits in the Academy's biological center, which is under construction, is being contemplated.

The first section of the scientific equipment collective utilization system is already in its third year. It has cost accounting and budget departments and laboratories which specialize in universal analysis and testing methods (for example, tests on climatic installations, molecular spectral analysis, electronic microscopy of biological objects, X-ray diffraction, etc.). In addition, the system has technical subunits which provide an accounting, control of the status and use of scientific equipment, its technical and metrological maintenance, and the economic calculations of rates for services. In the future these services will be broadened and strengthened.

One can judge the great effectiveness of these systems by the results of the three-year work of the Department of Atomic Absorption and Emission Analysis created on the base of the sector of physical research methods of rocks and minerals of the Academy's Institute of Geophysics and Geology. Analyses of soils, rocks, underground water and plants mainly for the needs of the institute, were carried out here earlier. Now the circle of analyzed substances has been substantially widened--there are analyses of drainage water, industrial deposits and solutions, alloys, metal surfacings, ceramics, animal tissue, blood plasma, food products, and wine materials. In all, about 30 chemical elements are being identified.

In addition to the Academy's institutes, VUZ's of the republic, the scientific-production associations "Yaloveny" and "Viyerul," the Moldavian Scientific Research Institute of the Food Industry, the All-Union Planning and Technological Institute, a meat-packing plant, and other institutions and enterprises are enjoying the services of the department. The department is carrying out a large amount of work jointly with the Physico-Chemical Institute of the UkSSR Academy of Science and the Odessa Technological Institute of Food Production, and an agreement has been concluded for the analytic testing of a spectrograph with "Spektr"-type holographic arrays developed in Kazan.

In 1980-81, 12 new analysis techniques were created and put into operation, the number of which, per one thousand of equipment cost, almost tripled in comparison with 1978 and the output of each worker almost doubled. With the creation of this system, the circle of scientific equipment users was widened on the average six-fold, it became accessible to each scientist, and the cost of standard analyses and tests decreased by 1.5-2 times.

A substantial growth in the republic system for the collective utilization of scientific equipment and a broadening of the contacts between the Academy and the republic's VUZ's are also envisioned in this area. For example, the Institute of Applied Physics of the MSSR Academy of Sciences and the Kishinev State University and Polytechnical Institute acquired, for per unit starts, the radiospectrometer RE-1307, which was subsequently given on balance to the TsAM of the Academy where the operation of the device was organized in the collective utilization system. Subunits of the TsAM are already servicing more than 60 organizations of the republic.

Work is being carried out jointly with the Institute of Mathematics and the VTs /computer center/ of the MSSR Academy of Sciences on the creation of a collective utilization computer center. It combines programmed specialized mini and micro-computers and multipurpose EVM's /electronic computers/ of the head computer center

into a unified computer complex. Its subscriber points and local computer centers are organized in all the buildings of the academic town. The introduction into operation of this entire system is planned for 1984, but at the present time a number of automated complexes (for amino acid analysis, molecular spectroscopy, a problem-oriented complex for ecologic-genetic research, etc.) are already active within its limits. Automated data banks are being created.

Metrology and the centralization of the means of measurement occupy an important place in the collective utilization system of the scientific experimental base. It has been basically completed and at the present time 85 percent of the Academy's instrument stock of the profile in question has been concentrated on the balance of the TsAM. The centralization of the means of measurement has provided for their efficient utilization (the usage coefficient rose to the highest in the country) and the operational technical and metrological servicing of the scientific subunits.

Metrological service includes repair and checking of radio engineering, electrical engineering, thermal engineering, physico-chemical and other measurement means. Now this work is being conducted, on the average, twice as fast as in foreign organizations. An exchange fund of measurement means is being formed. Their centralization has led to a definite standardization of their types, simplifying operation and maintenance work. It has also lowered the wages to maintain them--our rate for hiring measurement instruments is 25 percent lower than the all-union figure.

In the years 1982-85, the metrological and technical maintenance of measurement devices of a physico-chemical and biotechnical profile will be further developed, the scope will be broadened and the quality of the services rendered (the delivery of instruments to the work places, the checking on individual instruments there, etc.) will be improved, the departmental repair schedule and the checking of the measurement devices become greater, and their financing and centralized acquisition system will be improved.

Familiarity with the activities of collective utilization systems of this base has shown that their cost accounting subunits are better developed and equipped. This is explained by the fact that an assessment there of the activities of the collective and its moral and material stimulation have been connected with the intensification of equipment usage, the speediest introduction of it into operation, and the improvement in the quality and operativeness of maintenance. Moreover, two types of payment for service are used--piece-rate, when a specific order is paid for and subscription, under which maintenance is guaranteed during an accounting time period.

Our four-year work experience has convincingly demonstrated the effectiveness of cost accounting systems of collective utilization of scientific equipment. It was approved at a January 1982 seminar conference, held at our academy, which was attended by the vice presidents and chief scientific secretaries of the presidiums of the academies of science of the union republics, deputy chairmen of the presidiums of the scientific centers and affiliates of the USSR Academy of Science for the study of developed and active systems of collective utilization of unique equipment and the automation of experiments.

The collective utilization of scientific equipment and measurement and testing equipment--this is a new business and, naturally, requires thorough study in order to find ways, procedures, and methods for improving it. At the MSSR Academy of Sciences, for example, attempts are being made to quantitatively determine the cost of decisions made, the effective limits and degree of "collectivization," and its tempo. Of course, "collectivization" does not exclude, either now or in the future, some procedures for the individual utilization of a scientific experimental base. However, it is advisable to centralize its maintenance in this case.

There are definite difficulties in developing collective utilization systems. They are connected mainly with the fact that the utilization of scientific equipment and measurement devices is actually not considered either on a country or an industry scale. Norms and generally accepted criteria for assessing the effectiveness of their utilization are lacking, time periods for operational introduction have not been standardized, and different procedures for hiring devices are not being encouraged.

The efforts of the management of the MSSR Academy of Sciences and the TsAM collective are now directed at finding ways to further increase the effectiveness of the systems of collective utilization of the scientific experimental base, and to decrease the payment for services, mainly of their operational part.

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NEW SCIENTIFIC-ECONOMIC ASSOCIATION, ITS ROLE IN KAZAKH SSR EXPLAINED

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 7, Jul 82 pp 55-56

[Article by S. Bayzakov, chairman, organizational bureau, KaSSR Scientific-Economic Association, doctor of economic sciences, professor, in the column "Information": "The Scientific-Economic Association"]

[Text] In February of this year, the VTsSPS[All-Union Central Council of Trade Unions] approved a decree concerning the creation of a scientific-economic association(SEA) in our country. In order to carry out the organizational work necessary for the formation of its branches in union republics, krays, oblasts, industrial firms and institutions, and to convene the first constituent assembly, the presidium of the Central Committee for Trade Unions of State Institutional Workers and the presidium of the All-Union Council of Scientific and Technical Societies formed an organizational bureau under the chairmanship of academician T. S. Khachaturov.

For its part, the presidium of the Republic Committee for Trade Unions of State Institutional Workers and the Republic Council on STS[Scientific and Technical Societies] of the KaSSR on 31 Mar 82 approved a decree which deals with the management of the orgburo[organizational bureau] regarding the establishment of branches in oblasts and commercial enterprises and regarding the convening of the SEA republic conference.

The purpose of the new association is to assist in carrying out CPSU economic policy aimed at raising the efficiency of national production, increasing the rational use of resources, improving production planning and control, and thereby assuring continued increases in the well-being of the Soviet people.

The association will focus particular attention on economic and social problems having to do with scientific and technological progress, the development and disposition of manpower, environmental protection, and on issues regarding labor productivity, the fuller use of production capacities and fixed capital, increasing the effectiveness of capital investments, the rational use of raw materials, fuel-energy and other material resources, strengthening the economic system, and improving economic mechanisms in all sectors of the national economy.

In order to achieve these objectives, the SEA, together with other organizations and institutions, will conduct discussions and studies of designs in standardized documentation, complex national economic and regional programs, and will organize

conferences, meetings and seminars for the purpose of developing courses of action and arriving at effective solutions to problems of planning, administration and economics in the daily affairs of the planning and economic offices of industrial concerns, organizations and institutions under ministries and departments.

The new association is a public service organization of the economic community. Its actual members may be drawn from the staffs of planning, financial, statistical and economics departments in the following systems: Gosplan, Ministry of Finance, Gossnab, Goskomtrud[State Committee for Labor and Social Problems], Goskomtsen [State Committee on Prices], TsSU[Central Statistical Administration], Gosbank, and Stroybank[Bank for Financing Capital Investments]; they may also be economists from academic or scientific fields.

Economics instructors at VUZ's and technical schools and at institutes for improving specialized skills, students of economics departments in VUZ's and technical schools, as well as staff members of academic institutes comprise the active membership of the SEA, regardless of their departmental affiliation.

Staff workers and specialists from economics offices, research workers in commercial enterprises and institutions of all sectors of the national economy, as well as staff members of research and design institutes may also become active members of the association, while at the same time remaining members of the corresponding branch STS's with which their firm or institution is affiliated.

Organizations and institutions of Gosplan, Ministry of Finance, Gossnab, Goskomtrud, Goskomtsen, TsSU, Gosbank and Stroybank may collectively join the association with full legal rights of membership.

The SEA, by virtue of its organizational structure, is one of the specialized governing bodies of the republic STS. It is therefore essential to be guided by all standards documentation of the USSR STS in the process of creating it.

For the purpose of encouraging creative initiative among SEA members, dealing with urgent national economic problems, arranging conferences and meetings, and carrying out other useful measures, and upon the advice of primary organizations, municipal, oblast, republic and central management boards of SEA's, workshops will be established which will combine the participation of leading economics scholars and the staffs of planning, financial, statistical and banking institutions, as well as groups involved in material-technical supply, etc..

The number of such workshops under the direction of a primary organization, and their scientific-economic quotas are to be determined from the "Recommendations on the Continued Development and Improvement of the Organizational Structure and Modes of Interaction in the Scientific and Technical Activity of USSR STS Committees, Workshops and Research and Development Associations". SEA members may participate in one or more workshops, according to their choice.

The operation of the workshop will be under the direction of a bureau composed of a chairman, secretary and members. The bureau is to be affirmed by the presidium of management board or council of the primary organization.

The workshops direct the creative research initiative of association members to the identification and more complete utilization of production reserves, and to more rapid integration of economic advances into the national economy; they promote expansion and continued reinforcement of the creative collaboration between scientific and production personnel; they organize purposeful work for research collectives composed of academic economists, staffs of planning, financial, statistical and banking institutions, material-technical supply facilities, which is intended to resolve scientific-economic problems; they make preparations for and conduct scientific-economic conventions, conferences and symposiums called for by SEA management plan; they provide assistance to SEA management boards in organizing efforts to improve the skills of scientific-economic personnel and other specialists; they participate in the development, assessment and modification of training programs for dealing with critical problems in the science of economics in VUZ's, technical schools and institutes for improving specialized skills; they take part in designing and implementing measures related to increasing the economic knowledge of association members; they develop the subject matter and specifications of competitions and investigations dealing with individual problem areas, and they participate in conducting them and providing results; they correlate and disseminate advances in the science of economics, widely employing for this purpose specialized economic journals and periodicals, radio, conferences and schools of advanced skills; they provide continuous assistance to participants in socialist competitions in the development and fulfillment of socialist commitments and individual and collective creative design plans; they render aid to SEA members in developing and implementing their suggestions for improving production organization and economy, increasing product quality, economizing material resources, fuel-energy resources, etc..

Workshops of central, republic, kray, and oblast managements exercise methodical supervision and provide assistance to their counterparts in lower-level SEA organizations.

Both permanent and temporary commissions for dealing with specific scientific-economic problems may be set up under the control of SEA management boards or councils, as required.

Financial expenditures for measures implemented under workshop plans are provided for in the planning estimates and budgets SEA management boards or orgburos work out.

For their active participation in the development of suggestions and recommendations concerning major scientific-economic problems, in the implementation of a national standard for their acceptance, in the organization and high-level supervision of scientific-economic meetings, conferences, symposiums, competitions, examinations, and other measures, workshop members may be awarded the All-Union STS badge titled "For Diligent Effort in STS", SEA certificates, or be singled out for other special incentives by the SEA central management board.

At the present time, in all oblasts of the republic, orgburos are being formed and conferences are being convened for the purpose of selecting primary organization councils and SEA oblast management boards. Considerable assistance is being provided to us in this task by party, Soviet, trade union and economic organizations.

Conferences for the selection of SEA republic management boards will be held in July of this year, while the first constituent assembly of the USSR Scientific-Economic Association, which will adopt regulations and set concrete objectives for the new member of the Soviet economic community, will take place at the end of the year.

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